# RE-MOO-VING BARRIERS WITHIN LABOR: EXPLORING CURRENT EVENTS RELATED TO DAIRY AND POULTRY LABOR MARKETS

By

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ABSTRACT

RE-MOO-VING BARRIERS WITHIN LABOR: EXPLORING CURRENT EVENTS RELATED TO DAIRY AND POULTRY LABOR MARKETS

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Dairy labor markets have the potential to undergo notable change in the near future due to tightening labor markets and increased activity by worker advocacy groups. Given this context, this dissertation explores three areas related to dairy labor markets. In the first essay dairy workers are surveyed to identify their preferred compensation packages to assist farmers in offering the most attractive benefits to recruit and retain workers. The final two essays move along the supply chain to see how consumers may impact dairy labor markets particularly in relationship to ongoing demand for changes to animal welfare practices. In the second essay whether consumers are willing to pay a price premium for a label certifying working conditions is estimated. Additionally, attention is directly to answering, if consumers are willing to pay a premium (1) is it greater than or less than a premium for animal welfare labeling and (2) does it change under different information settings. Finally, the third essay explores the public's preferences for worker welfare practices compared to animal welfare practices. For additional robustness, the last two essays are also applied to the egg production system to explore labor effects in other animal-based agricultural production sectors.

# ACKNOWLEDGEMENTS

When a project takes years to complete there are a number of people who were likely involved and essential to its completion along the way. I would like to thank a few of those people by name here. However, before I do I would like to give a general word of thanks to the fellow students in my cohort who traveled this journey with me, for professors' patience and time, and to my friends and family who supported me along the way. My longest-term supporters have been and continue to be my parents, Bruce and Diane Kaminski. I am certain that I could not have finished this process without you. Thank you and I love you.

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# KEY TO ABBREVIATIONS

| | |
|---|---|
| BWS | Best- Worst Scaling |
| DCE | Discrete choice experiment |
| EFI | Equitable Food Initiative |
| FARM | Farmers Assuring Responsible Management |
| MNL | Multinomial logit model |
| MXL(-EC) | Mixed logit model (with error component) |
| NAWS | National Agricultural Workers Survey |
| RUT | Random utility theory |
| USDA | United States Department of Agriculture |
| WTP | Willingness-to-pay |

# ESSAY 1: DAIRY WORKERS' JOB PREFERENCES: A CASE STUDY IN MICHIGAN

## 1.1 Introduction

Many economic sectors in the United States are suffering from labor shortages, including the agricultural sector (Taylor, et al., 2012; Hertz and Zahniser 2013; Fatka 2019). Labor shortages are fostered in part due to declining immigration from Mexico, as these immigrants compose a sizeable portion of agricultural laborers (Charlton and Taylor, 2016). Additionally, tight labor markets increase competition for workers even among low-skilled employment sectors. Since the agricultural sector in the United States employs only 1.3% of the workforce (USDA ERS, n.d.) understanding the main factors driving employees to choose agricultural labor is becoming crucially important.

Understanding preferred working conditions among dairy workers may help in alleviating the labor shortage and high turnover in the industry. Thus, this study uses a discrete choice experiment (DCE) (Hensher et al. 2005; Hensher et al. 2015) to assess current and potential dairy workers' preferences for jobs differentiated by alternative compensation packages. Specifically, we limit our sample to individuals in Michigan, a high dairy production state. In addition, since prior related research has shown that contracts at other points in the supply chain are influenced by behavioral preferences (Fischer and Wollini, 2018; Khanna, et al., 2017; Krah, et al., 2018), this study also elicits risk and time preferences to explore whether preferences for alternative compensation packages vary across different worker groups.

This study contributes to the literature in three important ways. First, to the best of our knowledge, this study is the first to use a survey methodology that explicitly elicits workers' job preferences requiring trade-offs between compensation benefits. While there is an extensive

body of literature on how farmers enter production contracts domestically (for example, Bergtold, et al., 2017; Khanna, et al., 2017; Krah, et al., 2018) and abroad (for example, Broch and Vedel, 2012; Fischer and Wollini, 2018), which is analogous to an employment contract, there is less information on how agricultural employees enter into work relationships. Existing literature in this vein tends to be focused on rural medical professionals in developing countries (for example, Ubach, et al., 2003; Huicho, et al., 2012; Miranda, et al., 2012; Rockers et al., 2012; Rao, et al., 2013; Rockers et al., 2013; Kunaviktikul, et al., 2015; Scott, et al., 2015; Song et al., 2015; Efendi, et al. 2016; Smitz, et al., 2016; Takemura, et al., 2016). Only recently has literature on employment preferences in agricultural sectors been introduced by Van den Broeck, et al. (2016) in Senegal and Schuster, et al. (2017) in Peru.

Research on U.S. agricultural employee work decisions has relied on secondary data to infer preferences (Gabbard and Perloff, 1997). To the authors' knowledge, Nolte and Fonseca (2010) is the only paper to explore agricultural worker preferences for employment conditions in the United States using primary data. However, their approach is limited in that they ask for conditions that would make work more appealing in a setting that is removed from real-life employment decisions.

We help introduce a methodology still new to the field of agricultural job preferences. More specifically, together with Mas and Pallais (2017), this study extends the use of discrete choice experiments from other fields into the agricultural labor economics toolkit. A DCE, such as the one employed in this study, dictates that respondents make choices between alternatives, preventing respondents from rating all attributes as equally important. Our experimental design mirrors real-world decision making for job choice by asking respondents to choose between job

profiles described by compensation packages varying in their benefit attributes and attribute levels.

Our next contribution borrows from the farmer contract literature, incorporating risk and time preferences to explore preference heterogeneity across individuals (Fischer and Wollni, 2018; Krah, et al., 2018; Bergtold, et al., 2017; Khanna, et al., 2017; Broch and Vedel, 2012). To our knowledge, this is the first study that explores behavioral factors (risk and time preferences) that contribute to employment contract decisions. Finally, to the best of our knowledge, this is the first study exploring workers' preferences in the dairy industry. Therefore, we contribute to the job preference literature by introducing a case study of a hard to reach population.

Survey results in this study suggest that dairy workers work many more hours than non-dairy workers who are potentially interested in joining the dairy industry labor force. However, workers reveal that they would prefer working fewer hours per week on average. Additionally, our results generally indicate that workers' greatest priority is a retirement plan. Yet, more future-oriented individuals value a retirement plan more than present-minded individuals. Besides this interaction with time preferences, behavioral preferences (risk and time preferences) do not seem to influence compensation package preferences.

The next section describes the design of the choice experiment and experiments for eliciting risk and time preferences. In the third section, we describe the data. Then we outline estimation methods, followed by the empirical results. Finally, we conclude with a summary of results, implications and limitations of the study, and suggestions for potential further research.

## 1.2 Experimental Design

A tablet-based survey via Qualtrics was administered face-to-face to prospective, current, and past dairy workers, who had the choice of English or Spanish translations.[1] The survey had three sections. It began with questions on demographics and work history. Section two was a choice experiment on job selection. Finally, risk and time preference questions were asked.

### *1.2.1 Discrete Choice Experiment: Attribute Selection and Experimental Design*

In our DCE application, workers make a discrete choice from a set of presented job options, which contain alternative compensation packages described by different attributes (benefits and hours worked) combined within each choice task or choice question. To identify the benefits and thus design the compensation packages to include in the experiment, we followed two steps. First, prior literature on compensation preferences was consulted to identify the types of compensation available in various industries. Then, focus groups with dairy laborers were conducted to identify the labor benefits in the dairy industry and thus redefine the compensation packages. In what follows, we describe in detail the procedures followed in each step.

In identifying the prior literature on compensation preferences, we focus on three streams of prior literature: job retention/satisfaction factors in U.S. agriculture , job preferences of rural medical professionals , and job preferences in international agricultural sectors.[2] From the

[1] Additionally, respondents could choose to complete the survey themselves (read it) or with the aid of a research assistant (have it verbally read to them and answer orally).

[2] There are a number of relevant studies here. For those on job retention/satisfaction in U.S. agriculture see Gabbard and Perloff (1997) and Nolte and Fonseca (2010). For job preferences of rural medical professionals see Ubach, et al. (2003), Huicho, et al. (2012), Miranda, et al. (2012), Rockers, et al. (2012), Rao, et al. (2013), Rockers, et al. (2013), Kunaviktikual, et al. (2015), Scott, et al (2015), Song, et al. (2015), Efendi, et al. (2016), Smitz, et al. (2016), and Takemura, et al. (2016). For job preferences in international agricultural sectors see Van den Broeck, et al. (2016) and Schuster, et al. (2017).

attributes used in prior works we identified the following list of attributes that appeared in at least two streams of literature: (quality of) employer provided equipment, health insurance/care, hours worked, housing, length of contract, shift schedule, training, transportation services to/from work, treatment by employer, and wage level. Ten attributes would be too large for an experimental design in our context, so our next task was to reduce this list. Attributes, like treatment by employer, that could not be easily quantified were removed. This was because the primary interest of this study lay in explaining economic decisions made by workers; by including subjective measures such as the way one's employer treats employees, respondents may differ in their choices because of their different views of appropriate behavior of employers. Such variation would potentially contribute to measurement error.

To redefine the compensation packages towards understanding the dairy context, we conducted three focus groups which helped affirm a subset of benefits identified in the existing literature and identified benefits which are specific to the dairy industry.

The focus led to selection of seven attributes. The next step was to define the levels for each of the attributes. The list of attributes and their levels is reported in Table 1.1

**Table 1.1** Choice Experiment Attributes and Levels

| **Attributes** | **Levels** |
|---|---|
| *Wage* | 15% less than current wage, Current wage, 15% more than current wage |
| *Hours (average per week)* | 48/56/70/84 |
| *Health insurance* | Present/Absent |
| *Retirement Plan* | Present/Absent |
| *Housing* | Housing Allowance/On-site housing/None |
| *Meat bonus* | Present/Absent |
| *Quality Incentive* | Present/Absent |

Wage is the first attribute, with three levels which depend on respondents' current wage based on the convention of previous studies in industries where the wage rate was highly variable or unknown (Ubach, et al., 2003, Rockers, et al. 2013, Kunaviktikul, et al., 2015; Scott, et al., 2015; Song, et al. 2015, and Takemura, et al., 2016). Four levels of average hours worked per week were selected, ranging from 48 to 84 hours.[3,4]

The following four attributes (health insurance, retirement plan, meat bonus and milk quality incentive pay) were either included (present) or excluded (absent) from each job description, with a specific description of each provided to respondents. For example, the description of the retirement plan was developed based on the employer matching system that some dairy farmers described in focus groups. A detailed description of all other attribute levels is reported in Exhibit A1.1 of the Appendix[5]. One of the reasons health insurance was included in this dichotomous fashion is that it is analogous to welfare benefits (Kunaviktikul, et al., 2015; Song et al., 2015) and free health care (Van den Broeck, et al., 2016) used in prior studies. A meat bonus is the opportunity to purchase beef at reduced market prices. As workers may be economically disadvantaged or looking to save money for the future or family in Mexico, savings on quality meat products are attractive. Finally, the quality incentive is a lump-sum payment only received if the quality of milk meets certain standards.[6] Focus groups suggested

[3] The closest attributes to hours worked found in the literature were change in the hours worked (Ubach, et al., 2003; Scott, et al., 2015) and work schedule (Huicho et al., 2012; Miranda, et al., 2012).
[4] The number of hours worked per week on average were all selected to be above 40 hours to avoid conflating the number of hours worked and (overtime) pay rate. Hour levels were chosen to represent feasible shifts, for example six eight-hour shifts or seven twelve-hour shifts.
[5] The descriptions of the attribute levels and the accompanying table were provided to all respondents during the experiment.
[6] The most similar attribute in extant literature is a performance based financial award (Rockers, et al., 2013).

that there is high variability in whether farms offer a quality incentive and in whether workers view it as a positive (chance to increase income) or negative (causes income to vary and not entirely within the control of the individual).

Finally, the last attribute was housing which had three levels. It was either excluded from the job description or if included was defined as on-site housing or a housing allowance. Employer provided housing was important in the focus groups but seemed to vary in quality. Therefore, we included employer provided on-site housing and a housing allowance which provides more flexibility to the worker in terms of accommodations for the housing levels. Similar housing attributes and levels are frequent in the rural medical literature (Huicho, et al., 2012; Miranda, et al., 2012; Rockers et al., 2012; Rockers et al., 2013; Kunaviktikul, et al., 2015; Efendi, et al. 2016; Smitz, et al., 2016; Takemura, et al., 2016).

Considering two profiles at a time, altogether these seven attributes and their levels resulted in $(2^4 \times 3^2 \times 4^1)^2 = 331{,}776$ possible choice tasks. To reduce fatigue effects, we followed Street and Burgess (2007) and performed a D-Optimal design in two steps, which resulted in 72 questions distributed across eight blocks. Workers were randomly assigned to only one of the eight blocks. In addition, the nine questions in each block were randomized to reduce order effects. An example choice task is provided in Figure 1.1.

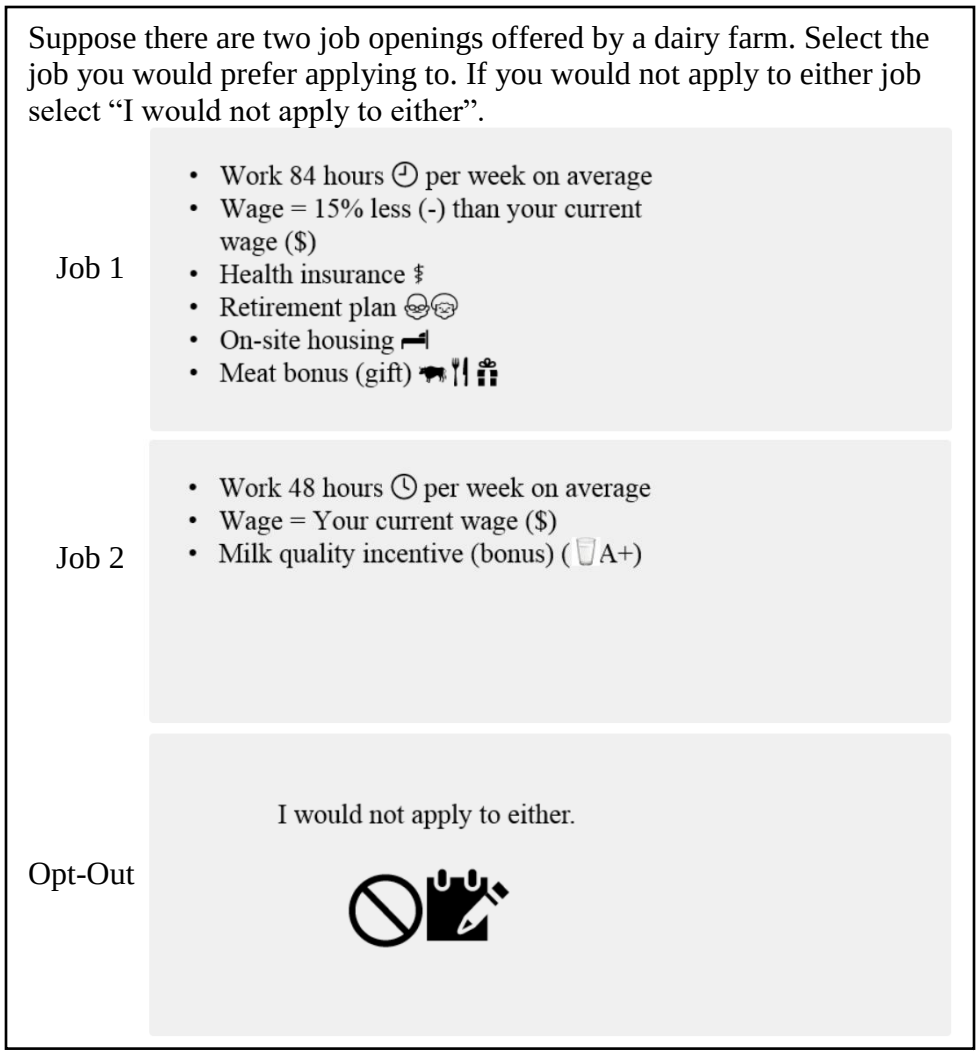


**Figure 1.1** Example Choice Task

*1.2.2 Eliciting Risk and Time Preferences*

After the choice experiment, respondents completed two qualitative risk and time preference questions. To illustrate, respondents indicated on an 11-point scale a self-assessment of their preferences in response to the following questions: *"Please tell me, in general, how willing or unwilling you are to take risks."* and *"How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?"* The risk question has been used in many prior studies, most notably since 2004 by the German Socio-Economic Panel

(SOEP).[7] Likewise, the time preference question has been utilized by other researchers (see for example Falk et al. 2016; 2018). A benefit to this question format is that it is quick and low-cost. Additionally, the questions involve no math unlike lottery-framed questions, which may make the question format easier to comprehend among individuals with low levels of educational attainment. Finally, the questions are not context-dependent and capture general behaviors. A nationally representative validation study suggests general question framing is the best fit to a variety of risk contexts ranging from financial (holding stocks and incentivized lottery) to career (being self-employed) (Dohmen et al., 2011). Additionally, generality allows categorization of respondents by preferences without having to assume a particular functional form for the utility function.

Responses from these questions were used to generate risk and time dummy variables. A respondent who answered 0-5 (unwilling) received a value of 0 and those above 5 (willing) a 1 as in Dohmen et al. (2011, p.328, footnote 10). Therefore, when the risk variable equals one the respondent is risk-loving (willing to take risks) and when the time variable equals one the respondent is patient or future-oriented (willing to wait for something more beneficial in the future).

### 1.3 Data

Dairy workers are a hard to reach population. Many dairy workers are immigrants, some of whom may not speak English, others who may not be authorized to work in the United States, and others who are simply distrustful of outsiders. Furthermore, dairy laborers work long hours

[7] Studies that use the SOEP risk preference data include Dohmen et al., 2011 and Caliendo et al., 2009. Studies that conduct primary data collection using this qualitative risk question include Dohmen et al., 2011 and Falk, et al., 2016; 2018.

and can be difficult to convince to participate in a survey. Therefore, study participants were recruited through community leaders and extension agents.

Individuals were eligible to complete our survey if they currently worked, had worked, or were interested in working in the dairy industry. A breakdown of respondents' demographics by current work status is available in Table 1.2. These demographics are compared to similarly known populations in Table A1.1 and Box A1.1 of the Appendix. In the remainder of this section we begin by describing the general demographics like gender and then proceed to describe work history and current employment statistics.

**Table 1.2** Sample Distribution by Work Status

| | Average (Mean) | | | | *t*-Test for Differences Across Groups (Yes = Significant at 0.05 level) | | |
|---|---|---|---|---|---|---|---|
| | Full Sample | Working on dairy farm (1) | Working not on dairy farm (2) | Not working (3) | 1 & 2 | 1 & 3 | 2 &3 |
| Female | 44% | 22% | 58% | 83% | Yes | Yes | Yes |
| Age | 33 | 33 | 33 | 35 | No | No | No |
| Born in the U.S. | 17% | 13% | 17% | 28% | No | No | No |
| Prior Dairy Work | 54% | 75% | 31% | 39% | Yes | Yes | No |
| Years Employed by Employer at Time of Survey | 3 | 3 | 2 | N/A | No | N/A | N/A |
| N | 109 | 55 | 36 | 18 | | | |

A sizeable majority of those unemployed were women, while 58% of those working outside of dairy and 22% of those working in dairy were women. While there were considerable differences in the share of women in each employment category, the groups were similar in terms of age. Most individuals were born outside the United States (mostly in Mexico). The

greatest share of U.S. born respondents was among individuals who are currently unemployed, although this amount was not statistically significantly different from other employment groups. Approximately three-fourths of respondents working in dairy at the time of the survey had worked for a different dairy previously to their current job, while nearly one-third who were not employed in dairy at the time but were interested in such positions had prior dairy industry experience. Individuals currently working on a dairy had been in their position for approximately as long as other individuals employed but not working in dairy at the time of the survey.

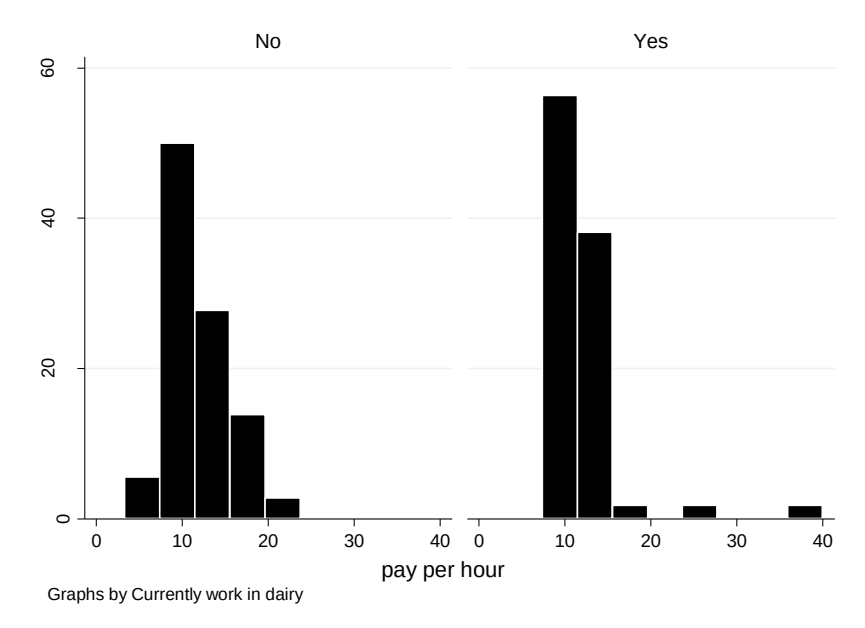


**Figure 1.2** Distribution of Reported Currently Hourly Wage by Employment in Dairy Sector

The distribution of wages for dairy workers was similar to that for people employed in other sectors but interested in or with prior experience in dairy as seen in Figure 1.2 (t-test two-sided p-value of 0.6360). Dairy workers earned $12.10 on average, while non-dairy workers earned $11.70. Respondents working in dairy at the time of the survey had a broader distribution of weekly average hours than non-dairy workers, centered at high levels. The distribution of

weekly hours for dairy workers was different to that for people employed in other sectors but interested in or with prior experience in dairy (t-test two-sided p-value of 0.9553) as seen in Figure 1.3. Approximately 67% of workers not in dairy worked 40 hours or less per week on average, while only about 25% of dairy workers worked 40 hours or less per week on average. The average weekly hours for those who were not working in dairy were 40 and for those who worked in dairy worked an average of 53 hours per week. In general, reported hours were consistent with reported hours from other dairy worker studies in Idaho (Salant et al., 2017, p.22) and New York (Maloney, et al., 2016, p.26-8).

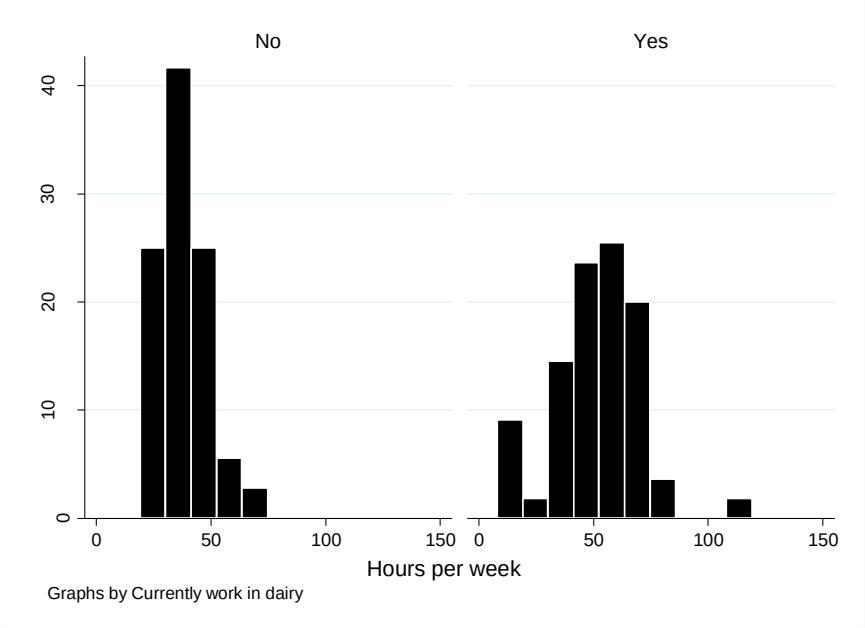


**Figure 1.3** Distribution of Reported Average Weekly Hours Worked by Employment in Dairy Sector

The greater hours worked by those in the dairy sector pays off as the income distribution is statistically greater (two-sided t-test p-value of 0.0054) than those not in the dairy sector. Calculated annual income, ignoring possible overtime pay, ranges from $4,784-$104,000 with a mean of $32,210 and median of $31,200 in the dairy industry. In contrast, annual income among respondents not in the dairy industry ranged from $4,776 to $54,080 with a mean of $24,782 and

median of $21,944. Using desired hours instead of actual hours worked, dairy workers still report higher desired incomes.[8] However, the maximum desired income declines to $84,500.

In addition to wage earnings, employees can receive a myriad of non-wage benefits. Table 1.3 depicts the distribution of benefits relevant to the DCE that were received by those in dairy relative to non-dairy workers. Most notable is that dairy workers receive on-site housing at much higher rates than other workers. Despite comprising a greater portion of our sample and working greater hours on average per week, fewer respondents working in dairy report earning overtime compared to those who are not in dairy, meaning that dairy workers may not be compensated extra for their additional hours worked compared to other sectors.

**Table 1.3** Percent of Respondents Earning Benefits by Employment in Dairy Sector

| Benefit | Percent Who Are Employed but Not Working in Dairy at Time of Survey | Percent Who Are Working in Dairy at Time of Survey |
|---|---|---|
| Overtime Pay | 38.9% | 20.0% |
| Health Insurance | 22.2% | 16.4% |
| Retirement Funds, Self-Paid | 8.3% | 3.6% |
| On-Site Housing | 21.2% | 68.5% |
| Housing Allowance | 0.0% | 5.6% |
| Food | 11.1% | 7.2% |
| Bonus | 16.7% | 23.6% |
| Incentive Pay | 8.3% | 18.2% |

### 1.4 Estimation Methods

Discrete choice models are consistent with random utility theory. Accordingly, we assume that workers have individual employment compensation preferences and select compensation

[8] We have data on the number of desired average work hours per week which we use for this calculation. We do not explicitly ask what the desired wage level is of respondents.

packages that maximize their utility. Utility is comprised of an observable, predictable component, $V_{njt}$, and some unexplained random component, $\varepsilon_{njt}$, as represented in Equation 1.

$$U_{njt} = V_{njt} + \varepsilon_{njt} \quad (1)$$

where $U_{njt}$ is the utility worker *n* derives from alternative *j* in choice question *t.* In this application, the deterministic portion of the utility function is expressed as

$$V_{njt} = \boldsymbol{\beta}'_{njt}\boldsymbol{x}_{njt} \quad (2)$$

where $\boldsymbol{\beta}'_{njt}$ is the vector of structural taste parameters, $\boldsymbol{x}_{njt}$ the multi-vector of observed variables, and $\varepsilon_{njt}$ is the independently and identically Gumbel distributed unobservable utility (error term).

Depending on the assumptions underlying the functional form of equation (2) and error term in equation (1), different discrete choice models can be estimated. In this application, a mixed logit model (MXL) for panel data is used to estimate the relevant parameters as it accounts for random taste variation and correlation in unobserved factors over time (Train, 2003). As shown in Train (2003), the probability that individual *n* makes a sequence of observed choices **i**, one for each choice task in the assigned sequence of *T* choice tasks, **i = (**$i_1$,..., $i_T$ ), , is represented by the following joint probability:

$$P_{ni} = \int \prod_{t=1}^{T} \frac{e^{V_{nit}}}{\sum_j e^{V_{njt}}} f(\boldsymbol{\beta}) d\beta \quad (3)$$

Because equation (3) lacks a closed form solution, the parameters of the model are estimated by simulated maximum likelihood estimation techniques following Train (2003). Halton draws (500) are used for the simulation rather than random draws as the former provide more efficient simulation (Bhat 2003).

Using equation (3), four models are specified. Model 1, which represents the baseline model, accounts for random taste variation. Hence, the observable portion of our underlying utility function for individual *n* from alternative *j* in choice task *t* is specified as follows:

$$V_{njt} = OptOut + \alpha_n Wage_{njt} + \beta_{n1} Hours_{njt} + \beta_{n2} Health_{njt} + \beta_{n3} Retire_{njt} + \beta_{n4} OSHousing_{njt} + \beta_{n5} HousingA_{njt} + \beta_{n6} Meat_{njt} + \beta_{n7} Quality_{njt} \quad (4)$$

where *OptOut* is the alternative specific constant indicating the no-application option, *Wage* is a continuous variable indicating the hourly wage,[9] *Hours* is a continuous variable representing the average number of hours worked per week. The remaining variables are dichotomous variables representing the presence/absence of a health insurance plan (*Health),* retirement plan (*Retire),* on-site housing (*OSHousing),* housing allowance (*HousingA),* meat bonus (*Meat),* and milk quality incentive (*Quality).* $\alpha$ is the coefficient of wage, while $\beta s$ are the coefficients representing the non-monetary attributes. The absence of health plan, retirement plan, housing accommodation, meat bonus and milk quality incentives represent the baselines.

The other three model specifications incorporate systematic differences across workers, i.e. risk and time preferences. To illustrate, Model 2 adds to Model 1 by including two interactions between health insurance and quality incentive with risk, *r*. Model 3 adds to Model 1 by incorporating the interaction between retirement plan and time preferences, *p*. Model 4 combined models 2 and 3 by including interaction terms for both risk and time preferences, as follows:

$$V_{njt} = OptOut + \alpha_n Wage_{njt} + \beta_{n1} Hours_{njt} + \beta_{n2} Health_{njt} + \beta_{n3} Retire_{njt} + \beta_{n4} OSHousing_{njt} + \beta_{n5} HousingA_{njt} + \beta_{n6} Meat_{njt} + \beta_{n7} Quality_{njt} +$$

[9] This variable was created by multiplying each individual's reported current hourly wage, or the prior earned wage if currently unemployed and with a prior job, or the federal minimum wage $7.25 if currently unemployed and never previously holding a job, by (1+*chwage),* where *chwage,* is the change in wage respondents saw in the choice experiment question, either -15%, 0%, or 15%.

$$\gamma_1(Health_{njt} \times r_n) + \gamma_2(Quality_{njt} \times r_n) + \gamma_3(Retire_{njt} \times p_n) \quad (5)$$

where $\gamma_1, \gamma_2$ and$\gamma_3$ are the coefficients capturing the interactions between the variables $Health_{njt}$, $Quality_{njt}$, and $Retire_{njt}$ and the risk ($r_n$) and time ($p_n$) preferences variables. The risk preference variable is equal to 1 if risk loving and zero otherwise, while the time preference variable is equal to 1 if patient (future oriented) and zero otherwise. All the other variables are specified as in (4).

Here we remind the reader of important information about the interpretation of results (presented in Table 1.4) from equations (4) and (5). For instance, the estimated population means represent the marginal utilities workers derived from the presence of the various attributes included in the experimental design (e.g., wage, hours, retirement plan, health insurance, on-site housing, housing allowance, meat bonus, and milk quality incentive). If they are positive and statistically significant, then their presence would increase workers' utility. Whereas if they are negative and statistically significant then workers' utility would decrease if they are present. For example, we would expect estimated population means of all our attributes, except perhaps hours, to be positive as receiving more compensation, whether in the form of wages or benefits, is generally preferred. For example, workers would prefer to have a higher wage as well to have a retirement plan as compared to not having it which is the baseline. We do not make a prediction about hours. Maloney, et al. (2016) mention that employers have moved from eight to twelve hour shifts at the request of workers for more hours, increasing salaries. However, since all hour measurements used in our study are above the standard 40-hour work week to avoid conflation with whether overtime is or is not offered, it is possible that respondents will view more work hours as a negative impact on their leisure time.

As marginal utilities, the coefficients from the MXL are not directly meaningful. Rather, in addition to whether they positively or negatively contribute to utility, the mean coefficient estimates are useful for generating a cardinal rank of preferences based on estimate magnitude. However, even this ranking is limited to variables that are coded in a similar fashion and thus are on the same scale. Therefore, in our study we can create a cardinal rank of health insurance, retirement plan, on-site housing, housing allowance, meat bonus, and milk qualitive incentive as these variables are all dichotomous. We cannot include wages and hours in this rank as these two variables enter utility in a continuous fashion.

Therefore, we compare the experimentally designed job attributes by looking at the marginal rate of substitution, calculated as the ratio of mean estimates of two attributes. The natural choice of common denominator is the estimated mean coefficient of the wage which then allows for us to interpret our results as the amount of money a worker is willing to pay and thus give up (if positive) or must receive (if negative) to have the numerator attribute. In other words, a positive sign of the coefficient ratio, with the wage coefficient in the denominator, indicates how much dairy workers would be willing to pay per hour to have more of the non-monetary job attribute, and a negative sign indicates how much hourly income dairy workers would be willing to accept to have more of the attribute. We report these calculations in Table 1.5.

## 1.5 Empirical Results

The estimates from the MXL models are reported in Table 1.4. We remind the reader that Model 1 accounts for preference heterogeneity by allowing for random taste variation. Models 2 through 4 add to Model 1 by also exploring differences between groups of people with different risk and time preferences. All variables were assumed to have a normal distribution except for

wage, which is assumed to follow a one-side triangular distribution and interaction terms which were assumed to be nonrandom.

**Table 1.4** Estimates from the Mixed Logit Model for the Full Sample

| **Variables** | **Parameters** | **Estimates** | | | |
|---|---|---|---|---|---|
| | | **Model 1** | **Model 2** | **Model 3** | **Model 4** |
| *Wage* | $\mu_1$ | 0.322*** | 0.326*** | 0.330*** | 0.327*** |
| | | (0.047)[A] | (0.049) | (0.049) | (0.048) |
| | $\sigma_2$ | 0.322*** | 0.326*** | 0.330*** | 0.327*** |
| | | (0.047) | (0.049) | (0.049) | (0.048) |
| *Hours* | $\mu_2$ | -0.050*** | -0.049*** | -0.051*** | -0.051*** |
| | | (0.007) | (0.008) | (0.008) | (0.008) |
| | $\sigma_2$ | 0.054*** | 0.061*** | 0.054*** | 0.055*** |
| | | (0.008) | (0.007) | (0.009) | (0.008) |
| *Health Insurance* | $\mu_3$ | 0.633*** | 0.727*** | 0.650*** | 0.697*** |
| | | (0.145) | (0.242) | (0.147) | (0.238) |
| | $\sigma_3$ | 0.588*** | 0.472 | 0.595*** | 0.589*** |
| | | (0.218) | (0.314) | (0.216) | (0.215) |
| *Retirement Plan* | $\mu_4$ | 1. 453*** | 1.442*** | 0.986** | 0.997*** |
| | | (0.249) | (0.250) | (0.349) | (0.3347) |
| | $\sigma_4$ | 1.938*** | 1.929*** | 1.906*** | 1.908*** |
| | | (0.270) | (0.286) | (0.266) | (0.265) |
| *On-site Housing* | $\mu_5$ | 0.438** | 0.453*** | 0.466*** | 0.446*** |
| | | (0.172) | (0.170) | (0.176) | (0.176) |
| | $\sigma_5$ | 0.332 | 0.218 | 0.393 | 0.392 |
| | | (0.314) | (0.283) | (0.288) | (0.287) |
| *Housing Allowance* | $\mu_6$ | 0.429** | 0.428** | 0.435** | 0.435** |
| | | (0.173) | (0.177) | (0.174) | (0.174) |
| | $\sigma_6$ | 0.127 | 0.436 | 0.045 | 0.054 |
| | | (0.466) | (0.266) | (0.517) | (0.483) |

**Table 1.4 (cont'd)**

| | | | | | |
|---|---|---|---|---|---|
| *Meat Bonus* | $\mu_7$ | 0.126 | 0.142 | 0.123 | 0.121 |
| | | (0.143) | (0.139) | (0.144) | (0.144) |
| | $\sigma_7$ | 0.563** | 0.552** | 0.569** | 0.573** |
| | | (0.143) | (0.263) | (0.221) | (0.222) |
| *Milk Quality Incentive* | $\mu_8$ | 0.527*** | 0.363 | 0.521*** | 0.366 |
| | | (0.157) | (0.258) | (0.156) | (0.251) |
| | $\sigma_8$ | 0.858*** | 0.804*** | 0.864*** | 0.857*** |
| | | (0.239) | (0.199) | (0.232) | (0.225) |
| *Opt-Out Option* | $\alpha$ | -0.298 | -0.331 | -0.255 | -0.268 |
| | | (0.605) | (0.631) | (0.626) | (0.616) |
| **Interaction terms** | | | | | |
| *Health*Risk* | $\mu_9$ | | -0.121 | | -0.069 |
| | | | (0.288) | | (0.290) |
| *Incentive*Risk* | $\mu_{10}$ | | 0.241 | | 0.238 |
| | | | (0.313) | | (0.308) |
| *Retirement*Time* | $\mu_{11}$ | | | 0.811* | 0.796* |
| | | | | (0.444) | (0.442) |
| **Model Statistics** | | | | | |
| *LLF* | | -657.32 | -658.73 | -655.66 | -655.34 |
| *# of Parameters* | | 16 | 18 | 17 | 19 |
| *# of Choices* | | 981 | 981 | 981 | 981 |
| *BIC* | | 1425 | 1441 | 1428 | 1442 |
| *AIC* | | 1347 | 1353 | 1345 | 1349 |
| *AIC3* | | 1363 | 1371 | 1362 | 1368 |
| *crAIC* | | 1357 | 1368 | 1357 | 1365 |

[A] Numbers in parentheses are standard errors.

In Model 1, all coefficients of the population means are statistically significant, except for the opt-out option and meat bonus. The latter, however, has a statistically significant random parameter (standard deviation) implying that many workers are insensitive to the meat bonus. The sign and magnitude of the mean coefficients indicate the directional impact and relative

importance to utility. As expected, the wage coefficient is positive, indicating that people prefer higher wages to lower ones. In addition, as indicated by the negative sign of the "hours" coefficient workers prefer fewer hours per week. This result confirms findings from previous studies (Nolte and Fonseca 2010), although counters the common notion in the industry that workers insist on working long hours. Moreover, health insurance, retirement plan, on-site housing, housing allowance, and milk quality incentive pay are all positive. Looking at the magnitude of their coefficients, the greatest preference is for a retirement plan. In contrast, housing attribute levels were the least preferred among the statistically significant results with on-site housing being marginally preferred to a housing allowance. Gabbard and Perloff (1997) also found that housing is ranked low compared to other benefits.

All estimates of the standard deviations are statistically significant. This indicates that there are differences in preferences among sample respondents for hours, health insurance, retirement plan, and milk quality incentive with the greatest variability for retirement plans. This means that although some workers strongly prefer a retirement plan and are made much happier with its presence, for some workers a retirement plan brings little or negative utility. The statistical significance of the standard deviations also indicates that hours, health insurance, retirement plan, and milk quality incentive structures will not be deemed equally appealing by all workers. Rather, on average, workers find them desirable, while a minority do not.

The last three columns of table 1.4 report the estimates from Models 2 through 4, which build on Model 1 by including various risk and time preference interaction terms with the choice experiment designed attributes. In all models (2-4), the interaction term between risk preferences and health insurance and milk quality are not statistically significant. This means that being risk averse versus risk loving has no differential impact on preferences for health insurance or milk

quality incentive pay. In contrast, the interaction term between being offered a retirement plan and one's time preferences is positive and statistically significant in Model 3 and when risk preferences are also introduced (Model 4). It makes intuitive sense that people who are future oriented are more likely to prefer a retirement plan than respondents who are present-minded.

According to the model fit criteria (Akaike Information Criteria (AIC) and 3-Akaike Information Criteria (3AIC), and corrected Akaike Information Criteria (crAIC)) Model 3 also resulted in the best model fit. Most notably, Model 3 produces similar results to Model 1. To illustrate, all attribute signs and statistical significance remain unchanged; the coefficient of wage is positive and, as indicated by the negative sign of the "hours" coefficient, workers prefer fewer hours per week. The relative preference rank is also the same across models 1 and 3; retirement plan is the most preferred attribute, followed by health insurance, milk quality incentive, on-site housing, and housing allowance.

We now take the results from Model 3 to calculate willingness to pay for each attribute.[10] The willingness to pay amounts and their 95% confidence intervals are reported in Table 1.5. In addition to the hourly wage equivalent that is produced directly from our original analysis (reported in column 2) we convert the hourly wage to annual income amounts which are reported in column 3.[11] A positive value represents the amount a worker is willing to forego from their wage to obtain the attribute, while a negative value represents the additional amount that the worker would need to be compensated, or paid, to take the attribute. As anticipated by the prior

[10] Marginal WTP for each attribute was calculated as the ratio between the coefficient of each non-monetary attribute (Retirement Plan, Health Insurance, Milk Quality Incentive, On-Site Housing, Housing Allowance, and Hours) and the coefficient of the monetary attribute (wage).
[11] Annual income amounts are based on the willingness to pay from the hourly wage times the mean hours worked per week (47) times the number of weeks per year (52).

analysis and prior expectations, all values are positive except for hours. This means that workers look favorably on and are willing to pay for all benefits except for higher hours.

**Table 1.5** Marginal WTP Estimates (Based on Full Sample (Table 1.4, Model 3))

| | **Marginal WTP Estimates (as Hourly Wage)** | **Marginal WTP Estimates (as Annual Salary)** |
|---|---|---|
| Retirement Plan | \$2.99***[A] | \$7,307.56 |
| | (1.16)[B] | |
| | [\$0.72, \$5.27][C] | [\$1,759.68, \$12,897.88] |
| Health Insurance | \$1.97*** | \$4,814.68 |
| | (0.569) | |
| | [\$0.86, \$3.09] | [\$2,101.84, \$7,551.96] |
| Milk Quality Incentive | \$1.58*** | \$3,861.52 |
| | (0.54) | |
| | [\$0.51, \$2.66] | [\$1,246.44, \$6,476.60] |
| On-Site Housing | \$1.41** | \$3,446.04 |
| | (0.63) | |
| | [\$0.18, \$2.65] | [\$439.92, \$6,476.60] |
| Housing Allowance | \$1.32** | \$3,226.08 |
| | (0.570) | |
| | [\$0.20, \$2.44] | [\$488.80, \$5,963.36] |
| Hours | -0.16*** | -\$391.04 |
| | (0.549) | |
| | [-\$0.23, -\$0.09] | [-\$562.12, -219.96] |

[A] The reported wage is for present-oriented individuals. [B] Numbers in parentheses are standard errors calculated using the Krinsky and Robb method in NLogit6; [C] 95% confidence interval in brackets, calculated using the Krinsky and Robb method in NLogit6.

More specifically, results indicate that farmers should prioritize retirement plans as part of employee compensation plans, as workers are willingness to pay \$2.99 per hour. Also, workers are willing to forego approximately 25% of their annual salary at the time of the survey for the presence of a retirement plan. The fact that workers are willing to forego a considerable amount of their wage is not necessarily so surprising. First, we are comparing the presence of a retirement plan to not having any retirement plan. As seen in Table 1.3, few respondents currently have a retirement plan. Therefore, according to the principle of diminishing marginal

utility, respondents may be willing to pay greater amounts for the initial presence of this attribute than they would if we were perhaps only changing the magnitude of the employer's contribution.

Retirement plans may also be attractive because many respondents either do not have access to banks and/or do not frequently save money. If the former, retirement plans represent access to compounded earnings that respondents do not otherwise have access to. Given the average age of our sample and assuming another 30 years of work, the future value of the amount that the employer would need to contribute today is greater than the annual salary respondents are willing to give up today. If the latter, then respondents may be willing to give up a portion of current salary to be forced to save for the future as consistent with the limited commitment savings literature (Gugerty, 2007).

While this survey was not administered to dairy owners to elicit their preferences for compensation structures, retirement plans may also be appealing from the employer perspective. To illustrate, if the average employee contributes the maximum possible that an employer will match, then a retirement plan will cost the employer $1,792.53.[12] The annual income that workers are willing to forego for a retirement plan is nearly four times higher than the average amount the employer would contribute.[13] To cover the employer's share of the retirement contribution they would need to reduce wages by only $0.74.[14] Thus, at no cost to the employer and a six percent reduction in average wage to the employee, workers will be appreciably happier with their employment compensation plan when it includes a retirement plan.

[12] This is the average salary ($29,875.57) times the employer contribution of 6%.
[13] Calculation: Marginal WTP for retirement plan as annual salary divided by the cost of retirement plans to employers (7,307.56/ 1,792.53).
[14] Calculation: The annual cost of retirement plans to employers divided by the average number of hours worked by employees each year (1,792.53 / (47 * 52))

It is worth exploring workers' willingness to pay (amount of wages one is willing to forego) for a health insurance plan given recent national debates about health insurance and its provision by employers. Our results indicate that health insurance is the second most important benefit that could be offered from those included in this study. The average worker would be willing to forego $4,814.68 annually in wages for health insurance. However, while this amount is near the required deductible of $6000 as outlined in benefit description (see Exhibit A1.1 in the Appendix), the majority are not willing to pay the full amount required. Nevertheless, it may be comforting that the deductible value is indeed within the 95% confidence interval. Altogether this suggests that workers will be happier if offered a health insurance plan by their employer but may still opt out from participating as they deem the minimum deductible too high.

The milk quality results are surprising given that risk aversion did not seem to impact preferences regarding the milk quality incentive. The average respondent is willing to forego twice the potential earnings from the milk quality incentive, even with the conservative estimate of the lowest bound of the 95% confidence interval, $1,246.44 compared to the maximum $600 possible earned a year. Perhaps workers do not consider their annual income and erroneously calculate the value of a $600 annual increase. Yet, recent discussions around good motivation strategies have encouraged worker choice, competency, and agency (Milligan 2020). It is also possible that a drive for these intangible factors may be factoring into the high willingness to pay for the milk quality incentive. The milk quality incentive may be highly ranked because it represents an area over which workers have control of their compensation. Dairy work can become monotonous and having autonomy over an outcome of the job may help with motivation. Plus, workers may feel a sense of fairness from this benefit which helps disperse the premium operators receive for Grade A milk to the workers who help produce its quality.

As our results indicate disutility from additional hours worked, employers would need to pay annually $391 per person per additional hour worked to make it worthwhile for the average surveyed worker to work the 48$^{th}$ hour. This amounts to only sixteen cents per hour more, but in aggregate suggests meaningful costs. Therefore, employers should be cautious to not assign shifts over 47 hours per week without offering overtime or a higher wage rate than currently offered for risk of dissatisfying employees to look for other employment. Note that this recommendation does not require employers to pay more than they do currently, as instead they could distribute shifts over a greater number of workers thus avoiding the concept of overtime.

To further explore potential differences (heterogeneity) in job attributes evaluation among workers, we performed a subsample analysis across groups of workers. More specifically, we separately estimated workers' preferences for alternative compensation packages within each demographic group of interest, foreign-born individuals and only respondents with (either current or past) experience working in dairy. We use the Model 3 specification since it was a better fit for our data. Demographics of these subsamples and the estimated coefficients are reported in the Appendix in Tables A1.2 and A1.3, respectively. In Table 1.6, we report the marginal WTPs for the various attributes, which allow for an easy comparison across groups while also solving issues related potential differences in scales among groups.

**Table 1.6** Marginal WTP Estimates as Hourly Wages of Sub-samples (Based on Table A1.3)

| | **Foreign-Born Individuals** | **Respondents with Dairy Experience** |
|---|---|---|
| Retirement Plan | $2.41*[A] | $2.87* |
| | (1.411)[B] | (1.627) |
| | [$-0.36, $5.18][C] | [-$0.32, $6.06] |
| Health Insurance | 2.19*** | $1.81*** |
| | (0.650) | (0.661) |
| | [$0.92, $3.47] | [$0.51, $3.11] |
| Milk Quality Incentive | $1.71** | $2.24** |
| | (0.691) | (0.942) |
| | [$0.35, $3.06] | [$0.40, $4.09] |
| On-Site Housing | $1.39** | $1.62** |
| | (0.685) | (0.777) |
| | [$0.05, $2.74] | [$0.10, $3.15] |
| Housing Allowance | $1.27** | 1.36* |
| | (0.648) | (0.789) |
| | [$0.00, $2.54] | [-$0.19, $2.91] |
| Hours | -$0.12*** | -$0.15*** |
| | (0.033) | (0.045) |
| | [$-0.19, $-0.06] | [-$0.24, -$0.06] |

[A] The reported wage is for present-oriented individuals. [B] Numbers in parentheses are standard errors calculated using the Krinsky and Robb (1986) method in NLogit6; [C] 95% confidence interval in brackets, calculated using the Krinsky and Robb method in NLogit6.

Just as there is general consistency across model specifications, results are also robust to different subgroup analysis. For example, for all subgroups the sign, statistical significance, and relative ranking among significant results of wages and hours remains constant. The sign and general statistical significance of the coefficients of the foreign-born and prior dairy experience subgroups also are the same. What is perhaps most interesting from this analysis is that respondents with prior dairy experience were willing to pay more for the milk quality incentive pay than they were the retirement plan. This could be because individuals with more prior dairy experience trust their ability to earn the incentive pay. This suggests that dairy operators who know that their workers have prior dairy experience (or considerable experience within their own company) may be highly motivated by a milk quality incentive structure. The fact that health

insurance remains statistically significant and highly ranked among both sub-samples suggests that a broad proportion of individuals in the dairy labor market are interested in health insurance. The former may be a result of the current national debate around health insurance and its importance in the U.S. Additionally, dairy work is highly labor intensive. While individuals may not sustain critical injuries subject to workers compensation, they may suffer from overuse or other ergonomic stressors that induce them to seek pain management or other medical assistance for which they would need medical insurance to mitigate costs. Overall, as our results seem to be robust among a variety of sub-sample populations, they provide insight on benefits that will appeal to many types of dairy workers.

## 1.6 Conclusion

In an environment of short supply and high turnover of dairy workers it is important to identify compensation packages that will help recruit and retain workers. We used a discrete choice experiment influenced by conversations with those in the industry and existing literature on rural medical professional preferences to estimate dairy workers' preferences for alternative compensation packages. Results from this study will provide new insights to dairy operators who may be struggling with labor shortages. For instance, by identifying worker preferences for job benefits, employers may be better able to attract and retain workers through the benefits they would offer. In other words, farmers will have a better understanding of how to structure work arrangements to meet workers' preferences. Second, by understanding the preference structure of dairy workers, they and advocacy groups, like Migrant Justice, will be better situated to negotiate for the most important working conditions. It is essential that both employers and negotiating employees identify potential factors that motivate and determine compensation preferences, to be

able to successfully match packages to employees. This study assists in this process by exploring whether risk and time preferences impact compensation plan preferences. Additionally, preferences are explored across different sub-group sample populations. Finally, descriptions of current dairy workers and their working conditions are provided which fills an information vacuum on current norms within the dairy industry which had previously been addressed only in New York (Maloney et al. 2016) and Idaho (Salant et al. 2017).

Our results generally suggest that dairy workers prefer compensation and working conditions similar to that of competing industries. A retirement plan is preferred over health insurance, housing, meat bonus, and an incentive pay system. A retirement plan provides a commitment device for workers to save for the long-term. Such a plan may also be particularly attractive to those who do not have a bank account with compounded interest.

Additionally, in contrast to the notion that dairy workers desire as many hours as possible (Maloney, et al. 2016), workers prefer to work fewer hours per week. This could be because in this experiment respondents chose between work week hours that were all both above their average current hourly work week and above the traditional 40-hour work week used as a baseline for many overtime and benefit decisions. It could be that workers prefer more hours up to either 40 hours or their current weekly schedule (47 hours) but would be less happy with more hours beyond that point. It is worth further exploration whether this is the case and if so, where the maximum utility is generated relative to the number of hours worked.

Another area for continued research is exploring the observed preference heterogeneity (statistically significant standard deviation estimates in Tables 1.4 and A1.3) among dairy workers. Doing so would require a large (national) sample than available here. Additionally, since our results indicate that future-oriented workers are willing to forgo higher wages for a

retirement plan than present-oriented individuals it could be worth pondering how to identify individuals in each group and offer the most attractive plan to them. Finally, while not necessarily an area for further research, it is interesting to repeat in the discussion of heterogeneous preferences, that workers with prior dairy experience change their relative rankings of health insurance plans and milk quality incentive pay structures. Respondents with dairy experience are willing to pay more of their current wage for the incentive plan structure. This could be because the incentive pay structure gives them a sense of agency and control over their work, which they may not feel that they have in many other aspects of the job and which have been linked to higher levels of motivation.

That workers who have prior dairy experience are willing to gamble with their annual income earnings via a milk quality incentive pay structure than those without dairy experience is not that surprising; however, many of our other results are surprising as they are largely the inverse of the frequency with which workers currently receive such benefits. As compensation plans are negotiated between workers and employers, the ultimate bundle of attributes offered will also be influenced by employer preferences and financial capacity. Therefore, compensation plans in the dairy industry may need to be restructured. For instance, employers should consider offering a retirement plan to their workers. This may have a particularly strong effect on recruiting more workers into the industry thereby addressing their labor shortage concerns. Another important implication of our study is that once operators are able to attract more workers they may want to reduce shift length and/or the number of shifts so that workers work fewer hours per week. Our results are also informative for policy makers as they affirm the addition of overtime pay of agricultural workers, an issue recently debated in the New York legislature.

The generalizability of these results is subjected to some limitations. For example, because of the difference in reported preferences and benefits currently accepted in the industry and the high levels of willingly foregone wages there is some need for caution in interpreting results. Despite attempts to make the choice experiment clear to respondents by offering clear attribute descriptions and pictorial representations of attributes, it is possible that respondents overestimated their willingness to forego wages in exchange for other benefits. Despite this, our results can provide direction to dairy farmers looking for potential solutions to their labor supply challenges.

# APPENDIX

# APPENDIX

**Exhibit A1.1** Handouts to Respondents Describing Choice Experiment Attributes

1. The health insurance plan provides "Bronze" level coverage under the Affordable Care Act for you and any immediate qualifying dependents. The premium is paid by the employer but you are responsible for the deductible, approximately $6000, with a maximum out of pocket expense of $7,250. There is a 40% coinsurance for emergency room care after deductible and $40 primary doctor visit and $40 generic drug copays.

2. The employer offers voluntary enrollment into a 401K retirement plan. If you choose to participate, the employer will match 100% of the first 6% of your salary. For example, if you make $25,000 then the employer will add the same amount that you do up to $1,500.

3. When the employer offers on-site housing, they are providing you a furnished bedroom (bed, small dresser) of your own in a house shared with up to 5 other workers of the same gender. Housing is available only to the worker not his/her dependents. If you quit or are fired you must move out that day. When the employer offers a housing allowance, they provide $500 towards rent/mortgage payments. You receive the payment at the end of each month, meaning if you quit or are fired before month's end you forfeit the payment. You must provide the employer a copy of the lease/mortgage as proof of stable housing to qualify for the allowance. The allowance is fixed, meaning it does not depend on characteristics of the housing arrangement such as the location of the shelter or the number of people residing there.

**Exhibit A1.1 (cont'd)**

4. The meat bonus is the opportunity to purchase freshly slaughtered meat at reduced costs. You pay the processing fee of $0.40 per pound and can request a cow be slaughtered when you and other workers need the meat. You can request up to one cow's worth of meat for yourself per year, approximately 600lb raw.

5. Finally, the milk quality incentive is an additional amount of money added to payroll based on the milk quality and herd health over the prior month. Full-time milkers will receive $50 (half-time will receive $25) per month if the somatic cell count is under 150,000 for that month. Thus, a full-time employee could earn an additional $600 per year *if* farm performance hits quality and health standards every month.

| **Category** | Hours per Week/ Horas Por Semana | | | | Wage per Hour/ Salario Por Hora($) | |
|---|---|---|---|---|---|---|
| **Symbol** | | | | | + | - |
| **English Meaning** | 48 | 56 | 70 | 84 | More | Less |
| **Spanish Meaning** | | | | | Más | Menor |

| **Category** | Benefits/ Bonificaciónes | | | | | |
|---|---|---|---|---|---|---|
| **Symbol** | $ | | | | | |
| **English Meaning** | Health Insurance | Retirement Plan | On-site Housing | Housing Allowance | Meat Bonus (Gift) | Milk Quality Incentive (Bonus) |
| **Spanish Meaning** | Seguro de Salud | Plan de Jubilación | Alojamiento en el Sitio | Subsidio de Vivienda | Bonificación de Carne (Regalo) | Incentivo de Calidad de Leche (Bonus) |

= No Application =No Aplicaria a Ninguno

**Table A1.1** Sample Distribution Comparisons

| | Average (Mean) | | | | | | *t*-Test for Differences Across Groups (Yes = Significant at 0.05 level)[A] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | This Study | | | | | | | |
| | NAWS 2016 [B] | Maloney, et al. (2016) | Full Sample (0) | Working on dairy farm (1) | Working not on dairy farm (2) | Not working (3) | NAWS & 0 | NAWS & 1 | NAWS & 2 | NAWS & 3 |
| Female | 23% | 4% | 44% | 22% | 58% | 83% | Yes | No | Yes | Yes |
| Age | 40 | 31 | 33 | 33 | 33 | 35 | Yes | Yes | Yes | No |
| Born in the U.S. | 23% | 0% | 17% | 13% | 17% | 28% | No | Yes | No | No |
| Prior Dairy Work | N/A | N/A | 54% | 75% | 31% | 39% | N/A | N/A | N/A | N/A |
| Years Employed by Employer at Time of Survey | 0 | N/A | 3 | 3 | 2 | N/A | Yes | Yes | Yes | N/A |
| N | 2508 | 205 | 109 | 55 | 36 | 18 | | | | |

[A] NY= Maloney (2016) sample [B] From U.S. Department of Labor (n.d.)

**Table A1.1 (cont'd).**

| | *t*-Test for Differences Across Groups (Yes = Significant at 0.05 level)[A] | | | |
|---|---|---|---|---|
| | NY & 0 | NY & 1 | NY & 2 | NY & 3 |
| Female | Yes | Yes | Yes | Yes |
| Age | Yes | No | No | No |
| Born in the U.S. | Yes | Yes | Yes | Yes |
| Prior Dairy Work | N/A | N/A | N/A | N/A |
| Years Employed by Employer at Time of Survey | N/A | N/A | N/A | N/A |
| N | | | | |

[A] NY= Maloney (2016) sample [B] From U.S. Department of Labor (n.d.)

**Box A1.1** Discussion of Sample Comparisons to Other Studies

There are a number of differences between our sample and comparable sample populations. However, there is also quite a range in the percent female, age, and foreign-born between our two comparison samples. Often our full sample and dairy workers at the time of the survey lie between the national agricultural workers survey (NAWS) and Maloney, et al. (2016) samples. Despite the statistical differences observed via t-tests, we maintain that our sample appears comparable to other samples of agricultural workers. Dairy workers are a hard to reach population, contributing to the scarce amount of research about them. As such we do not know of a national or Michigan specific sample of dairy workers to compare with our non-random sample. As a result, we need to look at the information from multiple sources available. NAWS is a national survey of agricultural workers but is limited to crops and therefore is not inclusive of dairy workers. Maloney, et al. (2016) concentrated on Hispanic dairy workers in New York. There may be differences between Michigan and New York dairy labor markets. Additionally, our sample includes non-foreign-born individuals who may have different demographics than the foreign-born population. The NAWS and Maloney, et al. (2016) samples create a wide range for demographic variables, within which our full sample and dairy workers at the time of the survey tend to fall. Thus while we again acknowledge that ours was not a random sample, similar to Maloney, et al (2016) and Salant, et al. (2017), we have reason to believe it is representative of our study population of interest.

**Table A1.2** Sub-sample Distribution Comparisons

| | Average (Mean) | | | | *t*-Test for Differences Across Groups (Yes = Significant at 0.05 level)[A] | | | |
|---|---|---|---|---|---|---|---|---|
| | Foreign-Born Sample | Dairy Experience Sample | NAWS 2016 [C] | Maloney, et al. (2016) | NAWS & Foreign-Born | NY & Foreign-Born | NAWS & Dairy Experience | NY & Dairy Experience |
| Female | 37% | 32% | 23% | 4% | Yes | Yes | No | Yes |
| Age | 34 | 32 | 40 | 31 | Yes | Yes | Yes | No |
| Born in the U.S. | 0% | 15% | 23% | 0% | N/A | N/A | No | Yes |
| Prior Dairy Work | 71% | 81% | N/A | N/A | N/A | N/A | N/A | N/A |
| Years Employed by Employer at Time of Survey | 3 | 3 | 0 | N/A | Yes | N/A | Yes | N/A |
| N | 112 | 91 | 2508 | 205 | | | | |

[A] NY= Maloney (2016) sample [B] From U.S. Department of Labor (n.d.)

**Table A1.3** Estimates from the Mixed Logit Model of Sample Sub-populations

| | | Only Foreign-Born Respondents | Only Respondents with Dairy Experience |
|---|---|---|---|
| **Variables** | **Parameters** | **Model 3** | **Model 3** |
| *Wage* | $\mu_1$ | 0.322*** | 0.317*** |
| | | (0.055)[A] | (0.065) |
| *Hours* | $\mu_2$ | -0.039*** | -0.047*** |
| | | (0.008) | (0.008) |
| | $\sigma_2$ | 0.047*** | 0.032*** |
| | | (0.008) | (0.006) |
| *Health Insurance* | $\mu_3$ | 0.707*** | 0.573*** |
| | | (0.164) | (0.170) |
| | $\sigma_3$ | 0.572** | 0.510 |
| | | (0.284) | (0.338) |
| *Retirement Plan* | $\mu_4$ | 0.777* | 0.910** |
| | | (0.417) | (0.409) |
| | $\sigma_4$ | 2.182*** | 1.764*** |
| | | (0.363) | (0.338) |
| *On-site Housing* | $\mu_5$ | 0.449** | 0.514** |
| | | (0.196) | (0.203) |
| | $\sigma_5$ | 0.312 | 0.347 |
| | | (0.269) | (0.342) |
| *Housing Allowance* | $\mu_6$ | 0.410** | 0.431** |
| | | (0.196) | (0.202) |
| | $\sigma_6$ | 0.399 | 0.041 |
| | | (0.312) | (0.641) |
| *Meat Bonus* | $\mu_7$ | 0.154 | 0.183 |
| | | (0.158) | (0.166) |
| | $\sigma_7$ | 0.626** | 0.582** |
| | | (0.298) | (0.260) |

**Table A1.3 (cont'd)**

| | | | |
|---|---|---|---|
| | $\mu_8$ | 0.550*** | 0.710*** |
| | | (0.188) | (0.193) |
| *Milk Quality Incentive* | | | |
| | $\sigma_8$ | 1.055*** | 0.894*** |
| | | (0.254) | (0.237) |
| *No-Application* | $\alpha$ | 0.419 | 0.119 |
| | | (0.720) | (0.769) |
| **Interaction term** | | | |
| *Retirement*Time* | $\mu_{11}$ | 1.187** | 0.748 |
| | | (0.558) | (0.547) |
| **Model Statistics** | | | |
| LLF | | -546.08 | -466.18 |
| # of Parameters | | 17 | 17 |
| # of Choices | | 819 | 657 |
| BIC | | 1206 | 1043 |
| AIC | | 1126 | 966 |
| 3AIC | | 1143 | 983 |
| crAIC | | 1141 | 985 |

[a]Numbers in parentheses are standard errors.

**REFERENCES**

## REFERENCES


Bergtold, J.S., Shanoyan, A., Fewell, J.E., Williams, J.R., 2017. Annual bioenergy crops for biofuels production: Farmers' contractual preferences for producing sweet sorghum. Energy 119, 724–731.

Bhat, C.R., 2003. Simulation estimation of mixed discrete choice models using randomized and scrambled Halton sequences. Transportation Research Part B: Methodological 37, 837–855.

Broch, S.W., Vedel, S.E., 2012. Using Choice Experiments to Investigate the Policy Relevance of Heterogeneity in Farmer Agri-Environmental Contract Preferences. Environ Resource Econ 51, 561–581. https://doi.org/10.1007/s10640-011-9512-8

Caliendo, M., Fossen, F.M., Kritikos, A.S., 2009. Risk attitudes of nascent entrepreneurs–new evidence from an experimentally validated survey. Small Bus Econ 32, 153–167. https://doi.org/10.1007/s11187-007-9078-6

Charlton, D., Taylor, J.E., 2016. A Declining Farm Workforce: Analysis of Panel Data from Rural Mexico. American Journal of Agricultural Economics 98, 1158–1180. https://doi.org/10.1093/ajae/aaw018

Dohmen, T., Huffman, D., Schupp, J., Falk, A., Sunde, U., Wagner, G.G., 2011. Individual Risk Attitudes: Measurement, Determinants, and Behavioral Consequences. Journal of the European Economic Association 9, 522–550.

Efendi, F., Chen, C.-M., Nursalam, N., Andriyani, N.W.F., Kurniati, A., Nancarrow, S.A., 2016. How to attract health students to remote areas in Indonesia: a discrete choice experiment. Int J Health Plann Mgmt 31, 430–445. https://doi.org/10.1002/hpm.2289

Falk, A., Becker, A., Dohmen, T., Enke, B., Huffman, D., Sunde, U., 2018. Global Evidence on Economic Preferences. Q J Econ 133, 1645–1692. https://doi.org/10.1093/qje/qjy013

Falk, A., Becker, A., Dohmen, T., Huffman, D., Sunde, U., 2016. The Preference Survey Module: A Validated Instrument for Measuring Risk, Time, and Social Preferences. IZA Discussion Paper No. 9674.

Fatka, J., 2019. Ag labor shortage fix offered for dairy industry [WWW Document]. Feedstuffs. URL https://www.feedstuffs.com/news/ag-labor-shortage-fix-offered-dairy-industry (accessed 6.24.19).

Fischer, S., Wollni, M., 2018. The role of farmers' trust, risk and time preferences for contract choices: Experimental evidence from the Ghanaian pineapple sector. Food Policy 81, 67–81. https://doi.org/10.1016/j.foodpol.2018.10.005

Gabbard, S.M., Perloff, J.M., 1997. The Effects of Pay and Work Conditions on Farmworker Retention. Industrial Relations 36, 474–488. https://doi.org/10.1111/0019-8676.00064

Gugerty, M.K., 2007. You Can't Save Alone: Commitment in Rotating Savings and Credit Associations in Kenya. Economic Development and Cultural Change 55, 251-282.

Hensher, D.A., Rose, J.M., Greene, W.H., 2015. Applied Choice Analysis, 2nd ed. Cambridge University Press.

Hensher, D.A., Rose, J.M., Greene, W.H., 2005. Applied Choice Analysis: A Primer. Cambridge University Press.

Hertz, T., Zahniser, S., 2013. Is There a Farm Labor Shortage? American Journal of Agricultural Economics 95, 476–481.

Huicho, L., Miranda, J.J., Diez-Canseco, F., Lema, C., Lescano, A.G., Lagarde, M., Blaauw, D., 2012. Job Preferences of Nurses and Midwives for Taking Up a Rural Job in Peru: A Discrete Choice Experiment. PLOS ONE 7, e50315. https://doi.org/10.1371/journal.pone.0050315

Jans, N., Frazer-Jans, J., Louviere, J., 2001. Employee choice modelling: Predicting employee behaviour under varied employment conditions. Asia Pacific Journal of Human Resources 39, 59–81. https://doi.org/10.1177/103841110103900305

Khanna, M., Louviere, J., Yang, X., 2017. Motivations to grow energy crops: the role of crop and contract attributes. Agricultural Economics 48, 263–277. https://doi.org/10.1111/agec.12332

Krah, K., Petrolia, D.R., Williams, A., Coble, K.H., Harri, A., Rejesus, R.M., 2018. Producer Preferences for Contracts on a Risky Bioenergy Crop. Appl Econ Perspect Policy 40, 240–258. https://doi.org/10.1093/aepp/ppx034

Krinksy, I., Robb, A. 1986. One Approximating the Statistical Properties of Elasticities. The Review of Economics and Statistics 68, 715-719.

Kunaviktikul, W., Chitpakdee, B., Srisuphan, W., Bossert, T., 2015. Preferred choice of work setting among nurses in Thailand: A discrete choice experiment. Nursing & Health Sciences 17, 126–133. https://doi.org/10.1111/nhs.12144

Maloney, T., Eiholzer, L., Ryan, B., 2016. Survey of Hispanic Dairy Workers in New York State 2016 (No. EB 2016-12). Cornell University, Ithaca, New York.

Mas, A., Pallais, A., 2017. Valuing Alternative Work Arrangements. American Economic Review 107, 3722–3759. https://doi.org/10.1257/aer.20161500

Milligan, B. 2020. [Online Presentation] http://www.dairystrategies.com/Portals/0/leadership.presentation.video.wmv

Miranda, J.J., Diez-Canseco, F., Lema, C., Lescano, A.G., Lagarde, M., Blaauw, D., Huicho, L., 2012. Stated preferences of doctors for choosing a job in rural areas of Peru: a discrete choice experiment. PLoS ONE 7, e50567.

Nolte, K.D., Fonseca, J.M., 2010. Vegetable field workers provide insight for improving farm labor retention at the U.S.-Mexican border. JAERD 2, 64–72.

Rao, K.D., Ryan, M., Shroff, Z., Vujicic, M., Ramani, S., Berman, P., 2013. Rural Clinician Scarcity and Job Preferences of Doctors and Nurses in India: A Discrete Choice Experiment. PLOS ONE 8, e82984. https://doi.org/10.1371/journal.pone.0082984

Rockers, P.C., Jaskiewicz, W., Kruk, M.E., Phathammavong, O., Vangkonevilay, P., Paphassarang, C., Phachanh, I.T., Wurts, L., Tulenko, K., 2013. Differences in preferences for rural job postings between nursing students and practicing nurses: evidence from a discrete choice experiment in Lao People's Democratic Republic. Human Resources for Health 11.

Rockers, P.C., Wanda, J., Laura, W., E, K.M., S, M.G., Francis, N., Kate, T., 2012. Preferences for working in rural clinics among trainee health professionals in Uganda: a discrete choice experiment . BMC Health Services Research 12, 212.

Salant, P., Wulfhorst, J.D., Cruz, E., Dearien, C., 2017. Community Impacts of Idaho's Dairy Workforce. University of Idaho's McClure Center for Public Policy Research.

Schuster, M., Vranken, L., Maertens, M., n.d. You Can('t) Always Get the Job You Want: Stated versus Revealed Employment Preferences in the Peruvian Agro-industry (Working Paper No. 2017/2), Bioeconomics Working Paper Series.

Scott, A., Witt, J., Duffield, C., Kalb, G., 2015. What do nurses and midwives value about their jobs? Results from a discrete choice experiment. Journal of Health Services Research & Policy 20, 31–38. https://doi.org/10.1177/1355819614554924

Smitz, M.-F., Witter, S., Lemiere, C., Eozenou, P.H.-V., Lievens, T., Zaman, R.U., Engelhardt, K., Hou, X., 2016. Understanding Health Workers' Job Preferences to Improve Rural Retention in Timor-Leste: Findings from a Discrete Choice Experiment. PLOS ONE 11, e0165940. https://doi.org/10.1371/journal.pone.0165940

Song, K., Scott, A., Sivey, P., Meng, Q., 2015. Improving Chinese primary care providers' recruitment and retention: a discrete choice experiment. Health Policy and Planning 30, 68–77. https://doi.org/10.1093/heapol/czt098

Takemura, T., Kielmann, K., Blaauw, D., 2016. Job preferences among clinical officers in public sector facilities in rural Kenya: a discrete choice experiment. Human Resources for Health 14, 1. https://doi.org/10.1186/s12960-015-0097-0

Taylor, J.E., Charlton, D., Yúnez-Naude, A., 2012. The End of Farm Labor Abundance. Applied Economic Perspectives and Policy 34, 587–598.

Train, K., 2003. Discrete Choice Methods with Simulation. Cambridge University Press, New York.

Ubach, C., Scott, A., French, F., Awramenko, M., Needham, G., 2003. What do hospital consultants value about their jobs? A discrete choice experiment. BMJ 326, 1432. https://doi.org/10.1136/bmj.326.7404.1432

U.S. Department of Labor, n.d. NAWS_F2Y185 [WWW Document]. Public Data files in Excel and CSV Formats. URL https://www.dol.gov/agencies/eta/national-agricultural-workers-survey/data/files-excel-csv (accessed 8.11.20).

USDA ERS - Ag and Food Sectors and the Economy [WWW Document], 2019. Ag and Food Sectors and the Economy. URL https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/ag-and-food-sectors-and-the-economy.aspx (accessed 6.23.19).

Van den Broeck, G., Van Hoyweghen, K., Maertens, M., 2016. Employment Conditions in the Senegalese Horticultural Export Industry: A Worker Perspective. Development Policy Review 34, 301–319. https://doi.org/10.1111/dpr.12153

# ESSAY 2: ARE CONSUMERS WILLING TO PAY MORE FOR ANIMAL WELFARE OR WORKER WELFARE LABELS? AN APPLICATION OF EGG AND MILK PRODUCTS UNDER DIFFERENT INFORMATION SETTINGS

## 2.1 Introduction

Recently, poor working conditions on farms and methods for their improvement have garnished media attention both in the United States and abroad. For example, after negotiations with dairy worker advocacy group Migrant Justice, Ben & Jerry's, a national ice cream company from Vermont, signed the Milk with Dignity agreement, which stipulates minimum working conditions for its milk suppliers (Scheiber 2017). Contracts between suppliers (like dairy farms) and processors (like Ben & Jerry's) are just one method of improving working conditions. As with other social desirability efforts, there are additional methods to drive industry reform. Perhaps a key option is the implementation of labeling programs, which serve as a vehicle to signal quality features and production practices that are often desirable to consumers.

Labeling programs on food attributes such as country of origin, production methods, nutritional properties, and carbon footprint, among others are exploding in modern food markets, and indeed many studies indicate that consumers are willing to pay a substantial price premium for products bearing such labels (Akaichi, et al., 2019; Bazzani et al., 2017; Gerini, et al., 2016; Lee et al., 2015; Van Loo et al., 2015; Van Loo, et al., 2014; Van Wezemael et al., 2014; Caputo et al. 2013; Aprile at al., 2012; Onozaka and Mcfadden, 2011; Van Loo et al., 2011). Yet, to date, only two labels exist that certify working conditions in U.S. agriculture: the Equitable Food Initiative (EFI) and Fair Food Program. Still, their application has been limited in the applicable produce, availability in retailers, and geographic location. For example, the EFI is limited to participating Costco Wholesale retailers and the Fair Food Program is limited to the Southeastern

coast. A natural question is whether the relative absence of worker welfare labels is due to their nascent introduction to markets or because consumers are uninterested in them and what they represent.

This study attempts to answer this question by exploring whether consumers are willing to pay a price premium for two animal-based food products, eggs and milk, bearing labels certifying working conditions. To add context to the experimental setting, decisions about products with worker welfare labels were made concurrently with decisions about products bearing animal welfare labels. Thus, we are able to explore the relative willingness-to-pay (WTP) for eggs and milk with worker welfare and animal welfare labels as well as the complementarity or substitution effects between them. Additionally, we provide different information treatments to assess how variations in prior knowledge may impact WTP and label interaction. Overall, we designed two studies on eggs and milk selection, each composed by three different information treatments.

This study makes a number of contributions to the fields of animal-product marketing and worker welfare. First, no prior study has explored consumers' preferences and WTP for worker welfare labels in animal-based food production. This study provides new insights into the food choice literature, with the ultimate goal of informing producers, worker advocates, and policymakers. To illustrate, assessing potential consumer demand for nascent worker welfare labeling programs will inform producers about the potential threats and trends to work condition scrutiny. As consumers grant farmers the social license to produce, it is vital that producers understand consumer expectations regarding production. A potential next step for proponents of such a labeling program is to gauge whether animal-based food products should be target products for these programs. As labor labels may be the next wave of social desirability labels to

enter the market, this contribution is timely and may assist with projections of consumer behavioral changes.

The lack of prior studies in this area, also means that despite the plethora of studies on animal welfare systems in egg production (Lusk, 2019; Paul, et al., 2019; Heng and Peterson, 2018; Ochs, et al., 2018; Doyon and Bergeron, 2016; Gerini, et al., 2016; Heng, et al., 2013; Andersen, 2011; Norwood and Lusk, 2011; Chang, et al., 2010, Bennett and Blaney, 2003; Rolfe, 1999; Bennett, 1997), there are no prior studies that explore consumers' preferences for animal welfare versus worker welfare labeling programs. It is feasible that there exists a trade-off between welfare beneficiaries in animal agricultural production. For example, research suggests that hen housing systems that improve animal welfare,[15] may depress the well-being of workers due to poor air quality and ergonomics (Coalition for Sustainable Egg Supply, N.D.). Such a tradeoff poses difficult questions for all actors along the supply chain in deciding which production method, and thus welfare beneficiary, to support. Even under production methods where a pareto improvement in welfare is possible, a comparison of willingness-to-pay for both labeling schemes informs producers of whether either or both programs are a lucrative method of product differentiation. Given that some producers may decide to concentrate on welfare

[15] Karcher, et al. (2015) posits that research on the pros and cons of hen rearing systems is ongoing, and this is likely true for other animal-rearing systems as well. Nevertheless, at least one source, the Coalition for Sustainable Egg Supply (N.D.), suggests a *potential* trade-off regarding the benefits for animals and stressors for workers of cage-free systems relative to conventional cages. We do not believe that the motivating framing of this paper depends on there being an actual scientifically proven trade-off, but rather the potential for the consumer to believe there is one, which the cited research could currently provide. Thus, while research into the welfare of animals and workers under different rearing systems is still needed and could impact the interpretation of this paper in the future or suggest its repetition based on new information, we suggest that regardless of which rearing system the reader believes better for animals (or humans), they may have faith and interest in the presented results.

standards for only one party, it is important for existing stakeholders of animal welfare labels to understand this potential competing or complementary label.

Further, stakeholders interested in adopting either social desirability label will want to know under which conditions it is/they are most effective. In particular, the information treatment results indicate that consumers are willing to pay a greater premium for labeled products when they have more information. This information helps marketers know which message to promote and suggests a return on investment to informational campaigns.

The remainder of this paper describes how we came to offer these contributions. It is structured as follows; in section 2.2 we review the closest strains of literature related to consumer preferences for animal welfare and worker welfare claims and illustrate the research hypotheses. Then we present the egg study followed by the milk study. Within each study we begin by describing the experimental and survey design, followed by the between-subjects treatment design. Then we describe the data, outline how it will be analyzed and present the results. After both studies have been presented we conclude the paper with a discussion of both studies, policy implications, and suggestions for further research.

## 2.2 Background and Research Hypotheses

How consumers value different animal welfare and worker welfare practices is explored in a cornucopia of research areas including socially acceptable credence attributes, social desirability labels, social responsibility labels, sustainable labels, and eco-labels. While terminology may differ, each of the aforementioned areas explores consumers' food choice behavior when presented with information about production practices that are not otherwise known by looking at the product. Such characteristics are called credence attributes (Caswell and Mojduszka, 1996). They are often disclosed by including a label on product packaging.

To date, several studies have investigated consumer preferences and WTP for animal welfare labels (Akaichi, et al., 2019; Van Loo, et al., 2014; Heng, et al., 2013; Norwood and Lusk, 2011; Chang, et al. 2010). Results from these studies generally indicate that consumers are willing to pay a price premium for various products bearing such labels, although the price premium may not entirely overcome the associated production costs (Akaichi, et al., 2019; Norwood and Lusk, 2011). Similarly, the few studies on consumer preferences and WTP for worker welfare labels (Drichoutis et al., 2017; Howard and Allen, 2008) found that consumers are willing to pay a price premium for quality standards certifying worker conditions on strawberries.[16] Taken together the results from these studies suggest that consumers positively evaluate both animal and worker welfare labels. However, none of these studies has analyzed either how consumers evaluate these labels simultaneously or the worker welfare label applied to animal-based food products. Hence, this study adds to the existing literature by exploring whether consumers are willing to pay a price premium for animal welfare and worker welfare labels on eggs and milk. We hypothesize that consumers are willing to pay a positive price premium for both labels on both animal-based food products (**$H_1$**).

Anticipating that consumers would be willing to pay a premium for both labels introduces two intriguing questions. For a given product, which label commands a greater premium? And, are animal welfare and worker welfare labels complements or substitutes? Existing studies have not investigated the potential substitution and complementarity effects between these two labels. Rather, a number of studies from the sociology literature (Howard, 2006; Howard and Allen, 2006, 2008, 2010) have concentrated on the relative ranking of various

[16] Fair Trade labels incorporate an element of worker welfare. However, fair trade would not necessarily apply to all workers whereas a worker welfare labeling program could. Therefore, we limit our discussion to labels solely and specifically targeted at worker welfare for a broad group of (all agricultural) workers.

"eco-labels" in which animal welfare and fair labor conditions are included. Based on rankings across production pairs, results from these studies reveal that respondents value animal welfare more than living wages for employees, which can be assimilated to worker welfare. Additionally, economic studies have found that animal welfare is valued more than other social desirability labels like organic and local (Akaichi, et al., 2019; Gerini, et al., 2016; Van Loo, et al., 2014). Hence, this study hypothesizes that the consumer price premium for products with the animal welfare label will be greater than for those with the worker welfare label (**$H_2$**)[17].

If the prior research exploring tradeoffs between animal welfare and worker welfare is sparse, literature on complementarity or substitution between them is nonexistent. Intuitively, one could imagine that people who care about the welfare of animals would also care about the welfare of other creatures as animals. Conversely, as in the egg example, consumers may see a trade-off (whether existing in reality or not) between improving conditions for animals or improving conditions for workers, at which point the labels would substitute for each other. Therefore, no prior expectations are formulated regarding the complementarity and substitution effects between the animal and worker welfare labels.

[17] Note that our second hypothesis stems from prior studies that have asked respondents to rank the importance of food topics. We could have also turned to the theoretical sociology literature, from which we would likely have drawn the opposite hypothesis. Sociology's stratification theory suggests an "underdog hypothesis" such that members of typically marginalized groups may be more likely to support other minority groups (Kendall et al., 2006). From our interpretation of the underdog hypothesis and stratification theory we proffer that since interactions with humans and work, and individual and relational well-being, are more often interacted with and considered than animal well-being, that revealed preferences in the form of action (behavioral decision making, choice) will be stronger for worker welfare than animal welfare. This relationship might be observed because improved conditions for workers are more likely to improve respondents' own positions compared to parallel improvements for animals. Thus, while we hypothesize that consumers will be willing to pay more for animal welfare labels than worker welfare labels we acknowledge that some individuals may expect the opposite relationship while still relying upon prior research.

Finally, previous food choice research has established that how much consumers are willing to pay for each label is likely not only influenced by the presence or absence of other labels on the product but also by how much information consumers have about the label (Caputo, 2020; McFadden and Huffman, 2017; Gifford and Bernard, 2011; Lusk, et al., 2004). Therefore, consistently with previous studies, we expect consumer WTP to increase when more information about both labels is provided to them (**H**$_3$).

To summarize, we make no prediction about whether animal welfare and worker welfare labels are complements or substitutes. However, we do expect that consumers will prefer animal welfare labels over worker welfare labels. We also expect consumers to prefer any labeled product to the conventional product. These preferences may vary with the level of information consumers have about the labels; specifically, that those with more information are willing to pay greater premiums and that they prefer worker welfare labels (which were previously unknown) even more. To test these hypotheses, we designed two discrete choice experiment studies on eggs and milk selection. In the following sections we describe the steps followed to design and analyze each of the studies as well as report the respective results.

## 2.3 Egg Study

### *2.3.1 Choice Experiment and Survey Design*

This study uses a hypothetical choice experiment on egg selection as worker welfare labels do not yet exist on this product. Eggs are particularly well suited for a study exploring labeling programs as the market is highly differentiated. For example, different production methods that impact animal welfare (e.g., animal welfare approved, cage-free, certified humane, pasture-raised and organic, which has provisions for animal housing) are already advertised via package labels. Most notably, eggs are an ideal product for exploring potential consumer trade-offs for animal

and worker welfare as one example of improving animal welfare for chickens, using a cage-free production system, may exacerbate worker respiratory systems and increase risk of other injuries thereby decreasing worker welfare (Coalition for Sustainable Egg Supply n.d.).

As our research concentrates on the potential trade-off, or complementarity, between animal welfare and worker welfare labeling programs, which has not been explored in other contexts, we simplify our experimental design to only include these two attributes and their interaction, plus price. Table 2.1 reports the attributes and attribute levels selected.

**Table 2.1** Egg Experimental Design: Attributes and Attribute Levels

| **Attributes** | **Attribute Levels** |
|---|---|
| Accredited Cage-Free Label | Absent |
| | Present |
| Fair Labor Label | Absent |
| | Present |
| Price | $0.89 |
| | $2.29 |
| | $3.69 |
| | $5.09 |

The cage-free label was chosen to represent animal welfare labeling for two primary reasons. First, cage-free labels and claims have become popular in the egg industry since some retailers pledged to only source cage-free eggs or as legislation has required egg production to be cage-free as in California (Lusk, 2019). Additionally, it is the cage-free aviary system that some researchers have identified as more harmful to workers than the conventional battery cage system (Coalition for Sustainable Egg Supply, n.d.). The Fair Labor label was a new one created by the authors for this study. The term fair was used to parallel the “Fair Food Program” and “Fair Trade” labeling systems which also include protections for workers. “Labor” was included to explicitly differentiate this potential new label from either of the fair food program or fair

trade labels and to draw attention to the worker welfare motivation/beneficiary. The price range was chosen to reflect the different prices for eggs in the market. Prices were determined based on the low and high reported national market prices for the prior year, December 1, 2017 through November 23, 2018. Low and high prices ranged from $0.39 (Southeast White A Large) to $7.98 (Northeast Brown Organic Large) per dozen, while the weekly weighted average price ranged from $0.49-$5.98 per dozen eggs (United States Department of Agriculture Agricultural Marketing Service, n.d.a). Additionally, these price ranges were then compared to those used in prior literature. Prior studies conducted in the last ten years used prices ranging from $0.50-4.99 for a dozen eggs (Lusk, 2019; Heng and Peterson, 2018; Gerini, et al., 2016; Heng, et al., 2013; Norwood and Lusk, 2011). Considering both recent national market prices and historical prices in prior studies, price ranges were finalized to those reported in Table 2.1.

An optimal in the orthogonal differences (OOD) fractional factorial design was generated following Street and Burgess (2007). The final design includes main and one-way interaction effects, with the latter being represented by the interaction between animal and worker welfare labels. The design resulted in 16 choice sets divided into two blocks, with both blocks equally likely in each treatment. Therefore, a respondent was randomly assigned to see one set of eight choice questions. An example egg choice question is presented in Figure A2.1 in the Appendix. The order of questions was randomized within each block to reduce order bias.

The survey instrument had four sections. The first section was “housekeeping”. It contained the consent question and screening questions. It concluded with the respective following language that ensured a common understanding of terminology (emphasis in survey): “Please keep in mind that for this survey *‘eggs’ refers only to eggs produced from chickens, not other animals.”* The next section proceeded by asking participants for information on their prior purchase behavior of eggs. The economic experiment comprised the third section of the study.

Prior to this section respondents were randomly assigned to an information treatment group. The survey concluded with demographic questions.

*2.3.2 Between-Subjects Treatments*

To explore whether consumer preferences and WTP for animal welfare and worker welfare labels varies under different information setting, we designed a between-subject experiment, whereby respondents were randomly assigned either to the *Control* or one of the two information treatments named as follows: *Label* and *Label & Media* (summarized in Table 2.2).

**Table 2.2** Information Treatments

| Treatment ID | Treatment Name | Information |
|---|---|---|
| 1 | *Control* | None |
| 2 | *Label* | Label Description |
| 3 | *Label & Media* | Label Description & News Article |

In the *Control* respondents were faced with 8 choice questions and they were not provided with any additional information about the animal welfare and worker welfare labels. Hence, it represents the baseline knowledge that consumers would bring with them into markets at the moment of the study. In the *Label* treatment, prior to the choice questions participants were provided with basic information about the meaning of both animal welfare and worker welfare labels. This information is what marketers hope or assume consumers know about the quality standards implied by a label which provides the value to the labeling program. In the *Label & Media* treatment, prior to the choice questions participants were faced with the same information as in the low information treatment plus they were asked to read a news article. The news article

was written for this study by the authors to explore the effect of popular media on decision behavior. It included mention of both worker welfare and animal welfare labels to not disproportionately skew responses toward one label. In this way the explicit information was in a format similar to but perhaps more balanced or comprehensive than tactics used by advocacy parties to express their point of view in public discourses. A detailed description of all information treatments is provided in Exhibit A2.1 of the Appendix. Common across all treatments were the choice experiment directions. The directions included both a cheap talk and consequentiality script as prior research has suggested that doing so may reduce hypothetical bias.[18] Directions and each other treatment element (label definitions and news article) were set on a timer to encourage thoughtful reading.

*2.3.3 Data*

Data was collected through a national survey administered online by Qualtrics from January-April 2019. A total of 536 respondents participated in our study, 179 in the *Control*, 178 in the *Label* treatment, and 179 in the *Label & Media* treatment. Respondents were required to be adults who had purchased eggs in the last three months. Basic demographics of the sample by experimental treatment are reported in Table 2.3. Our sample is skewed towards traditional

[18] Bias may result in reported greater willingness-to-pay in hypothetical experiments than real since the costs of choosing the purchase option are equal to zero. People may display social desirability bias where they believe that researchers prefer an option to be chosen over the no-buy alternative, that they are more willing to engage in with lower transaction costs (Norwood and Lusk, 2011). Reminding respondents of what the consequences would be in both a real shopping environment (cheap talk) and based on analysis of their responses with those from others (consequentiality) may reduce potential bias. We also capitalized the no purchase option in the directions to draw attention to this option. Nevertheless, we acknowledge that the hypothetical nature of our experiment should result in caution in extrapolating to future, real market scenarios when worker welfare labels will be introduced in food markets.

grocery shoppers and respondents to food surveys who are more often female (Aarnio and Lindeman, 2004 p.67; Costanigro et al., 2011 p.467-9). There were statistically significant differences across demographics in the three treatment groups despite random assignment.

**Table 2.3** Egg Sample Demographics

| | | **Control** | **Label** | **Label & Media** | p-value[A] |
|---|---|---|---|---|---|
| | | N=179 | N=178 | N=179 | |
| Age (over 18) | Continuous variable represents years of age | 45.283 (16.434)[B] | 43.423 (15.395) | 45.583 (15.899) | 0.000 |
| Gender | 1 if respondent female; 0 otherwise | 0.706 (0.457) | 0.674 (0.470) | 0.810 (0.393) | 0.000 |
| Education | | | | | |
| *Low* | 1 if respondent does not have high school degree; 0 otherwise | 0.028 (0.164) | 0.027 (0.163) | 0.011 (0.105) | 0.000 |
| *Mid* | 1 if respondent has a high school degree but not a bachelor's (4 year) degree; 0 otherwise | 0.678 (0.467) | 0.604 (0.489) | 0.739 (0.439) | 0.000 |
| *High* | 1 if respondent has bachelor's (4 year) degree or higher; 0 otherwise | 0.294 (0.456) | 0.368 (0.482) | 0.250 (0.433) | 0.000 |
| Income | | | | | |
| *Low* | 1 if respondent has income below $35,000 annually; 0 otherwise | 0.556 (0.497) | 0.571 (0.495) | 0.544 (0.498) | 0.039 |
| *Mid* | 1 if respondent has income between $35,000 and $100,000 annually; 0 otherwise | 0.444 (0.497) | 0.429 (0.495) | 0.456 (0.498) | 0.039 |
| *High* | 1 if respondent has income above $100,000 annually; 0 otherwise | 0.122 (0.328) | 0.099 (0.299) | 0.122 (0.328) | 0.000 |

**Table 2.3 (cont'd)**

| | | | | | |
|---|---|---|---|---|---|
| Race | | | | | |
| *Caucasian* | 1 if respondent is Caucasian; 0 otherwise | 0.800 (0.400) | 0.731 (0.444) | 0.733 (0.442) | 0.000 |
| *African American* | 1 if respondent is African America; 0 otherwise | 0.094 (0.292) | 0.148 (0.355) | 0.156 (0.362) | 0.000 |
| U.S. Census Region | | | | | |
| *Northeast* | 1 if resides in Northeast U.S. census region; 0 otherwise | 0.183 (0.387) | 0.225 (0.418) | 0.189 (0.391) | 0.000 |
| *Midwest* | 1 if resides in Midwest U.S. census region; 0 otherwise | 0.306 (0.461) | 0.231 (0.421) | 0.217 (0.412) | 0.000 |
| *South* | 1 if resides in South U.S. census region; 0 otherwise | 0.367 (0.482) | 0.357 (0.479) | 0.433 (0.496) | 0.000 |
| *West* | 1 if resides in West U.S. census region; 0 otherwise | 0.144 (0.352) | 0.187 (0.390) | 0.161 (0.368) | 0.000 |
| Political Party | | | | | |
| *Democrat* | 1 if respondent Democrat; 0 otherwise | 0.339 (0.473) | 0.319 (0.466) | 0.394 (0.489) | 0.000 |
| *Republican* | 1 if respondent Republican; 0 otherwise | 0.289 (0.453) | 0.291 (0.454) | 0.267 (0.442) | 0.020 |
| In-group Identification | Ranges from 1 (low national (American) in-group identification) to 5 (high in-group id) | 3.726 (0.777) | 3.716 (0.808) | 3.751 (0.834) | 0.115 |
| Illegal Aliens Scale | -1 if think negatively of illegal aliens; 1 if think positively of illegal aliens; 0 if neutral | -0.206 (0.941) | -0.209 (0.938) | -0.306 (0.914) | 0.000 |

[A] One-way ANOVA [B] Standard deviations are in parentheses

*2.3.4 Data Analysis*

Discrete choice experiments are consistent with Random Utility Theory (RUT) which postulates that if a product is chosen from a set then it routinely provides the individual greater utility than the other articles in that set. As shown in Train (2009), the utility that individual *n* derives from alternative *j* at choice situation *t* can be expressed as follows:

$$U_{njt} = V_{njt} + \varepsilon_{njt} \quad (1)$$

where $V_{njt}$ is the observed portion of utility and $\varepsilon_{njt}$ is the random, unobserved component. Assuming that the $\varepsilon_{njt}$ are distributed, Type I Extreme Value yields the familiar Multinomial Logit (MNL) model, which assumes preference homogeneity in the sample. That is: all coefficients of the utility expression in equation (1) are the same across individuals. However, if preference heterogeneity is expected, then a mixed logit model (MXL), which allows for a more flexible and continuous form of preference heterogeneity, should be specified.

Previous food choice studies have indicated that heterogeneity in consumer preferences is a pattern in demand analysis and that MXL models best describe food choice behavior (Tonsor, et al., 2009; Lusk and Schoeder 2004; Lusk, et al., 2003). Further studies have also shown that utilities of product profiles are indeed correlated (Scarpa et al., 2005; Scarpa et al., 2007a). Accordingly, the data were analyzed using a MXL with Error Component (MXL-EC) as it allows us to account for i) random taste variation by allowing the coefficients of animal welfare and worker welfare labels to vary randomly over individuals and to deviate from the population mean (Train 2009), and ii) for correlation across utilities by capturing the additional variance shared by the utility associated with the designed product alternatives but not by the opt-out alternative (Scarpa et al., 2005; Scarpa et al., 2007a). Further, the models were estimated in WTP-space to account for random taste variation associated with the cost coefficient (Scarpa et al., 2008) and with full-correlated random coefficients (Caputo, et al., 2013). Estimations in WTP-space allow for easy comparison across treatment groups as estimates are interpreted directly as marginal WTP values (Scarpa et al., 2008).

A total of three segmented MXL-EC models were estimated, one for each treatment: Model-C, Model-L, and Model-LC for the *Control*, *Label Information*, and *Label & Media*

*Information*, respectively.[19] For each treatment, we specified the following indirect utility function:

$$U_{njt} = \theta_i[-Price_{njt} + \omega_{n,AW}AW_{jt} + \omega_{n,ww}WW_{jt} + \omega_{n,AWWW}(AW_{jt} * WW_{jt}) + ASC + n_{njt}] + \varepsilon_{ijt} \quad (2)$$

where $\theta_i$ is the price scale parameter ($\theta_i = \frac{\alpha}{\lambda}$ where $\alpha$ is the price coefficient, and $\lambda$ is Gumbel scale parameter); *ASC* is the alternative specific constant which represents the opt-out option*;* $Price_{njt}$ is the observed price of the alternative in the choice experiment task; $AW_{njt}$ and $WW_{njt}$ are dummy variables coded 1 if the animal welfare and worker welfare labels respectively are present and 0 if absent; $(AW_{jt} * WW_{jt})$ is the experimentally designed interaction term between the AW and WW labels; $\omega$ terms represent the marginal willingness-to-pay for the respective attribute; $n_{njt}$ is the error component distributed normally with zero mean; and $\varepsilon_{ijt}$ is the error term. The label mean parameters are assumed normally distributed, while the price scale parameter is assumed log-normal distributed.[20]

To explore whether consumer WTP for animal welfare and worker welfare labels are significantly influenced by information provision we employed a pooled data approach and estimated three MXL-EC models to represent each of the treatment pairs: Model-CL, Model-CLM, and Model-LLM. More specifically, Model-CL was estimated by pooling the data from *Control* and *Label* treatments, Model-CLM was estimated by pooling the data from *Control* and

[19] A joint model restringing all the marginal WTPs for both animal welfare and workers welfare labels to be the same across the *Control*, *Label* and *Label & Media* treatments was also estimated. Results from the Log-Likelihood ratio (LR) test suggests that the Marginal WTP for both labels differ across treatments as the chi-square statistic exceed the 1 percent critical value (p-value<0.001). This evidence indicates that comparing the marginal WTPs from the various treatments is appropriate when estimating the models separately.

[20] We estimated models assuming the experimentally designed interaction between the two labels was normally distributed. However, the coefficient of the standard deviation was found never to be statistically significant. Therefore, it is assumed non-random.

*Label* & *Media* treatments, and Model-LLM was estimated by pooling data from the *Label* and *Label & Media* treatment groups. Following previous food choice studies (de Magistris et al, 2013; Bazzani et al., 2017, Lin et al., 2018, among others), the treatment effects were then estimated by using extended utility functions including interaction terms between a dummy variable identifying the treatment of interest ($Treat$) and each of the labels. For example, in the Model-LLM the utility was specified as follows:

$$U_{njt} = \theta_n[Price_{njt} + \omega_{n,AW}AW_{njt} + \omega_{n,WW}WW_{njt} + \omega_{n,AWWW}AW_{njt}WW_{njt} + ASC + \delta_1\left(AW_{njt} * Treat\right) + \delta_2\left(WW_{njt} * Treat\right) + \delta_3\left(AW_{njt}WW_{njt} * Treat\right) + n_{njt}] + \varepsilon_{njt} \quad (3)$$

The significance of $\delta$ and their signs represent the treatment effect on the marginal WTPs for the two labels. For *Treat* in the Model-CL and Model-CLM we used the *Control* as baseline, while in the Model-LLM the baseline is the *Label* treatment. The rest of the variables are as defined in equation (2).

*2.3.5 Results*

Table 2.4. reports WTP estimates from the MXL-EC models with full correlated random coefficients.[21] The first three columns report the three segmented models, which were estimated for each treatment group: Model-C (*Control*), Model-L (*Label Information*), and Model-LM (*Label & Media Information*). The last three columns report the estimates from the pooled models with Model-CL comparing the *Control* and *Label Information*, Model-CLM comparing the *Control* and *Label & Media Information* treatment group, and Model-LLM comparing the *Label Information* and *Label & Media Information* treatment groups.

[21] Cholesky matrices are reported in Tables A2.1, A2.2, and A2.3 in the Appendix.

**Table 2.4** Estimates from the MXL-EC with correlation in WTP-space for Eggs

| | Split Sample Models | | | Pooled Models | | |
|---|---|---|---|---|---|---|
| | **Model-C** | **Model-L** | **Model-LM** | **Model-CL** | **Model-CLM** | **Model-LLM** |
| **Variables/ Parameters** | | | | | | |
| Animal Welfare | | | | | | |
| μ | 0.72*** | 1.13*** | 1.28*** | 0.81*** | 0.85*** | 1.20*** |
| | (0.19)[A] | (0.23) | (0.24) | (0.18) | (0.19) | (0.20) |
| σ | 1.02*** | 1.44*** | 1.65*** | 1.24*** | 1.32*** | 1.57*** |
| | (0.18) | (0.18) | (0.20) | (0.12) | (0.12) | (0.13) |
| Worker Welfare | | | | | | |
| μ | 0.32* | 0.51*** | 0.78*** | 0.41*** | 0.49*** | 0.56*** |
| | (0.19) | (0.19) | (0.18) | (0.14) | (0.15) | (0.16) |
| σ | 0.74*** | 0.70*** | 1.23*** | 0.64*** | 0.92*** | 1.03*** |
| | (0.17) | (0.14) | (0.11) | (0.11) | (0.08) | (0.10) |
| Animal Welfare * Workers welfare | | | | | | |
| μ | 0.00 | -0.18 | -0.21 | -0.12 | -0.14 | -0.20 |
| | (0.28) | (0.26) | (0.23) | (0.19) | (0.17) | (0.17) |
| ASC | | | | | | |
| μ | -4.78*** | -5.30*** | -4.08*** | -5.09*** | -4.43*** | -4.58*** |
| | (0.41) | (0.48) | (0.34) | (0.32) | (0.15) | (0.28) |
| Error Component | | | | | | |
| *η* | 3.77*** | 3.60*** | 2.74*** | 3.62*** | 3.38*** | 3.13*** |
| | (0.88) | (0.97) | (0.32) | (2.06) | (0.78) | (0.26) |
| Price scale parameter | | | | | | |
| μ | -0.89*** | -1.03*** | -1.03*** | -0.96*** | -0.95*** | -1.04*** |
| | (0.02) | (0.03) | (0.04) | (0.02) | (0.02) | (0.02) |
| σ | 0.89*** | 1.03*** | 1.03*** | 0.96*** | 0.95*** | 1.04*** |
| | (0.02) | (0.03) | (0.04) | (0.02) | (0.96) | (0.02) |
| **Treatment Effects[B]** | | | | | | |
| *Label Treatment* * Animal Welfare | | | | 0.30 | | |
| | | | | (0.21) | | |
| *Label Treatment* * Worker Welfare | | | | 0.11 | | |
| | | | | (0.13) | | |
| *Label & Media Treatment* * Animal Welfare | | | | | 0.36* | 0.06 |
| | | | | | (0.22) | 0.26 |
| *Label & Media Treatment* * Animal Welfare | | | | | 0.26* | 0.22 |
| | | | | | (0.15) | 0.18 |

**Table 2.4 (cont'd)**

| **Model Statistics** | | | | | | |
|---|---|---|---|---|---|---|
| Number of Respondents | 179 | 178 | 179 | 357 | 358 | 357 |
| Number of Observations | 1432 | 1424 | 1432 | 2856 | 2864 | 2856 |
| Number of parameters | 11 | 11 | 11 | 13 | 13 | 13 |
| Log-likelihood function | -979.17 | -939.73 | -1005.08 | -1924.04 | -1997.4752 | -1946.87 |
| AIC/N | 1.383 | 1.335 | 1.419 | 1.356 | 1.404 | 1.372 |
| BIC/N | 1.423 | 1.376 | 1.460 | 1.384 | 1.431 | 1.400 |

[A]Standard errors are in parentheses. [B]The treatment variable is always a dummy variable equaling 0 for the lower numbered (less information) treatment

Looking at the segmented models first (Model-C, Model-L, and Model-LM), it can be noted that the coefficient on the opt-out option is always negative and statistically significant across all treatments, indicating that respondents would rather purchase any of the egg alternatives than not purchase. Additionally, in all treatments the standard deviation coefficient of the error component is statistically significant, suggesting that there is greater preference variability for the egg product profiles than the opt-out option. Interestingly, the interaction term is never statistically significant. This suggests that the value that consumers put on one label, animal welfare, is independent of the value associated to the other label, worker welfare, and vice-versa. They are separate concepts that are neither substitutes for each other nor complimentary methods of enhancing well-being for living creatures, both animal and human. Further, our results indicate that both the animal welfare and worker welfare labels are positive and significant across all treatments confirming our first hypothesis ($H_1$). Further, as conjectured ($H_2$), results reveal that consumers have a higher price premium for the animal welfare label over

the worker welfare label across all treatments. Yet, as expected, the magnitude of this premium increases with more information for both labels, indicating that price premiums for both labels increase when consumers are provided with more information ($H_3$).

To illustrate, in the *Control*, the estimated means of the marginal WTP distribution for the animal welfare label is $0.72, while it is only $0.32 for the workers welfare label. These values go up in the *Label* treatment, where the estimated means of the marginal WTP distribution is $1.13 and $0.51 for the animal welfare and worker welfare labels, respectively. As expected, an even higher price premium for both labels is found in the *Label & Media* treatment; again, the animal welfare label has the largest value estimate ($1.28), while the worker welfare label ($0.79) follows. Further, the significance of the estimated standard deviations around the means of the marginal WTPs for both labels suggest substantial heterogeneity with a general shift towards a higher share of positive marginal WTPs for both labels in the *Label* and *Label & Media* treatments. For example, the share of positive marginal WTPs for the animal welfare label is 76%, 78%, and 78% in the *Control, Labels,* and *Label & Media* treatments, respectively, while it is 67%, 77%, and 74% for the workers welfare label in the *Control, Labels,* and *Label & Media* treatments, respectively.

Turing to the results from the pooled models (last three columns of Table 2.4), it can be seen that in the Model-CL the coefficients of the interaction terms between each of the two labels and the *Label* treatment are not statistically significant, indicating that there is no difference in consumer valuation for both animal welfare and worker welfare labels between the *Control* and the *Label* treatments (the *Control* is the baseline). The results from the Model-CLM model, on the other hand, indicate that the marginal WTPs for both labels increase significantly when respondents are exposed to both label information and information from the news article (the *Control* is the baseline); the coefficients of the interaction terms between the animal welfare and

worker welfare labels and the *Label & Media* treatment is statistically significant from both labels: $0.36 and $0.26 for the animal welfare and worker welfare labels, respectively. This indicates that consumers are willing to pay $1.21 ($0.85+$0.36) for the animal welfare label and $0.75 ($0.49+ $0.26) in the *Label & Media* treatment, while only $0.85 and $0.49 in the *Control* and that these differences are statistically significant. These results are consistent with the marginal WTPs found in the segmented models. Finally, when looking at the results from the Model-LLM, it is apparent that there are no significant differences in consumer marginal WTPs for the two labels between the *Label* and *Label & Media* treatments as denoted by the insignificant coefficients of the interaction terms between the two *Label* and the *Label & Media* treatments (the *Label* treatment is the baseline).

## 2.4 Milk Study

### *2.4.1 Choice Experiment and Survey Design*

This study also uses a hypothetical choice experiment on gallon milk selection as worker welfare labels are not available for milk products in food markets. Milk is a frequently purchased item which is ideal for choice experiments. Milk is a model product for exploring consumer preferences for a nascent worker welfare label, specifically, as poor working conditions in the industry have been revealed on some operations according to Migrant Justice. This suggests a worker welfare labeling program may be particularly beneficial for some dairy industry workers.

Like the egg study, only three attributes were isolated so as to best explore WTP for worker welfare labeling compared to animal welfare labeling. These attributes and their levels are provided in Table 2.5. The animal welfare label differed from the egg study to a label that applied to milk. Specifically, the animal welfare approved label was chosen. The same author-designed Fair Labor label was used as the worker welfare label as in the egg study. Similarly,

gallon milk prices were determined by recent market prices ranging from $0.39 to $7.98 (United States Department of Agriculture Agricultural Marketing Service, n.d.b) and prior studies ranging from $1.13 to $7.00 (Caputo, et al., 2020; Caputo, et al., 2018; Crespi, et al., 2015; Wolf, et al., 2011; Brooks and Lusk, 2010; Olynk, et al., 2010).

**Table 2.5** Milk Experimental Design: Attributes and Attribute Levels

| Attributes | Attribute Levels |
|---|---|
| Animal Welfare Approved Label | Absent |
| | Present |
| Fair Labor Label | Absent |
| | Present |
| Price | $1.79 |
| | $3.19 |
| | $4.59 |
| | $5.99 |

As in the eggs study, we employed an optimal in the orthogonal differences (OOD) fractional factorial including main and one-way interaction effects, with the latter being represented by the interaction between animal and worker welfare labels. The design resulted in 16 choice sets divided into two blocks of 8 questions each, and respondents were randomly assigned to one block. An example milk choice question is presented in Figure A2.2 in the Appendix.

The milk study had the same four sections as the egg study. The study began with consent and screening questions plus the following language (emphasis in survey): *"*Please keep in mind that for this survey *'milk' refers only to milk produced by cows,* not other animals or similarly labeled plant products, like soy milk, almond milk, etc.*"* Then respondents indicated their prior purchase behavior of milk. An important question in this section was one that asked which package size individuals typically purchase. If individuals selected any size less than a

gallon, besides "other", they were dropped from the survey as prior studies have indicated a difference in milk attribute preferences by product size (Wolf et al., 2011). Then respondents were randomly assigned to an information treatment. The information treatments were the same as the egg study (*Control*, *Label*, and *Label & Media*, recall Table 2.2 and see Exhibit A2.2 in the Appendix), except that the animal welfare approved label definition replaced the cage-free one. In each treatment respondents were asked to answer 8 choice questions. The final section after the experiment contained demographic questions.

*2.4.2 Data*

Data collection concurred with that for the egg study. A total of 762 respondents participated in our study, 253 in the *Control*, 258 in the *Label* treatment, and 251 in the *Label & Media* treatment. Respondents were eligible to participate if they were adults who had purchased milk in the last three months. Sample demographics are presented in Table 2.6. There are several statistically significant observed differences between treatment groups across demographics within the sample despite random assignment.

**Table 2.6** Milk Sample Demographics

| | | **Control** | **Label** | **Label & Media** | p-value[A] |
|---|---|---|---|---|---|
| | | N=253 | N=258 | N=251 | |
| Age (over 18) | Continuous variable represents years of age | 44.806 (14.631)[A] | 42.874 (14.139) | 42.923 (15.905) | 0.000 |
| Gender | 1 if respondent female; 0 otherwise | 0.758 (0.428) | 0.731 (0.444) | 0.742 (0.438) | 0.013 |

**Table 2.6 (cont'd)**

| | | | | | |
|---|---|---|---|---|---|
| Education | | | | | |
| *Low* | 1 if respondent does not have high school degree; 0 otherwise | 0.032 (0.177) | 0.049 (0.217) | 0.027 (0.163) | 0.000 |
| *Mid* | 1 if respondent has a high school degree but not a bachelor's (4 year) degree; 0 otherwise | 0.704 (0.456) | 0.648 (0.478) | 0.626 (0484) | 0.000 |
| *High* | 1 if respondent has bachelor's (4 year) degree or higher; 0 otherwise | 0.263 (0.441) | 0.302 (0.460) | 0.346 (0.476) | 0.000 |
| Income | | | | | |
| *Low* | 1 if respondent has income below $35,000 annually; 0 otherwise | 0.559 (0.497) | 0.533 (0.499) | 0.527 (0.499) | 0.006 |
| *Mid* | 1 if respondent has income between $35,000 and $100,000 annually; 0 otherwise | 0.441 (0.497) | 0.467 (0.499) | 0.473 (0.499) | 0.006 |
| *High* | 1 if respondent has income above $100,000 annually; 0 otherwise | 0.086 (0.280) | 0.115 (0.320) | 0.115 (0.320) | 0.000 |
| U.S. Census Region | | | | | |
| *Northeast* | 1 if resides in Northeast U.S. census region; 0 otherwise | 0.204 (0.403) | 0.181 (0.385) | 0.154 (0.361) | 0.000 |
| *Midwest* | 1 if resides in Midwest U.S. census region; 0 otherwise | 0.280 (0.449) | 0.280 (0.449) | 0.258 (0.438) | 0.032 |
| *South* | 1 if resides in South U.S. census region; 0 otherwise | 0.387 (0.487) | 0.401 (0.490) | 0.170 (0.376) | 0.014 |
| *West* | 1 if resides in West U.S. census region; 0 otherwise | 0.129 (0.335) | 0.137 (0.344) | 0.170 (0.376) | 0.000 |
| In-group Identification | Ranges from 1 (low national (American) in-group identification) to 5 (high in-group id) | 3.964 (0.714 | 3.822 (0.709) | 3.750 (0.716) | 0.000 |
| Illegal Aliens Scale | -1 if think negatively of illegal aliens; 1 if think positively of illegal aliens; 0 if neutral | -0.430 (0.860) | -0.242 (0.930) | -0.253 (0.927) | 0.000 |

[A] One-way ANOVA [B] Standard deviations are in parentheses

*2.4.3 Data Analysis*

As for the eggs study, the milk data were analyzed using a MXL-EC model specified in WTP space. More specifically, we estimated three MXL-EC segmented models (Model-C, Model-L, and Model-LM for the *Control*, *Label*, and *Label & Media*, respectively) and three MXL-EC pooled models: Model-CL, Model-CLM, and Model-LLM. All models were estimated assuming full correlated random coefficients. Similarly, to the eggs study, we specified the following indirect utility function for the segmented models:

$$U_{njt} = \theta_i[-Price_{njt} + \omega_{n,AW}AW_{jt} + \omega_{n,ww}WW_{jt} + \omega_{n,AWWW}(AW_{jt} * WW_{jt}) + ASC + n_{njt}] + \varepsilon_{ijt} \quad (4)$$

where $\theta_i$ is the price scale parameter ($\theta_i = \frac{\alpha}{\lambda}$ where $\alpha$ is the price coefficient, and $\lambda$ is Gumbel scale parameter); *ASC* is the alternative specific constant which represents the opt-out option*;* $Price_{njt}$ is the observed price of the alternative in the choice experiment task; $AW_{njt}$ and $WW_{njt}$ are dummy variables coded 1 if the animal welfare and worker welfare labels respectively are present and 0 if absent; $(AW_{jt} * WW_{jt})$ is the experimentally designed interaction term between the AW and WW labels; $\omega$ terms represent the marginal willingness-to-pay for the respective attribute; $n_{njt}$ is the error component distributed normally with zero mean; and $\varepsilon_{njt}$ is the error term. The label mean parameters are assumed normally distributed, while the price scale parameter is assumed log-normal distributed.

The pooled models were specified as follows:

$$U_{njt} = \theta_n[Price_{njt} + \omega_{n,AW}AW_{njt} + \omega_{n,WW}WW_{njt} + \omega_{n,AWWW}AW_{njt}WW_{njt} + ASC + \delta_1(AW_{njt} * Treat) + \delta_2(WW_{njt} * Treat) + n_{njt}] + \varepsilon_{njt} \quad (5)$$

As in the eggs study, $\delta$ capture the treatment effects on the marginal WTPs for the two labels. In the Model-CL and Model-CLM we used the *Control* as baseline, while in the Model-LLM the baseline is the *Label* treatment. The rest of the variables are as defined in equation (4).

*2.4.4 Results*

Table 2.7 reports WTP estimates from the MXL-EC models with full correlated random coefficients.[22] The first three columns report three segmented models, which were estimated for each treatment group: Model-C (*Control*), Model-L (*Label*), and Model-LM (*Label & Media*), while the last three columns report the estimates from the three pooled models: Model-CL, Model-C-LM, and Model-LLM.

**Table 2.7**. Estimates from the MXL-EC with correlation in WTP-space for Milk

| | **Split Sample Models** | | | **Pooled Models** | | |
|---|---|---|---|---|---|---|
| | **Model-C** | **Model-L** | **Model-LM** | **Model-CL** | **Model-CLM** | **Model-LLM** |
| **Variables/ Parameters** | | | | | | |
| Animal Welfare | | | | | | |
| μ | 0.71*** | 1.22*** | 1.25*** | 0.74*** | 0.70*** | 1.20*** |
| | (0.17) | (0.18) | (0.18) | (0.16) | (0.15) | (0.15) |
| σ | 1.14*** | 1.77*** | 1.38*** | 1.47*** | 1.23*** | 1.56*** |
| | (0.13) | (0.13) | (0.16) | (0.09) | (0.10) | (0.10) |
| Worker Welfare | | | | | | |
| μ | 0.71*** | 0.78*** | 0.96*** | 0.71*** | 0.70*** | 0.79*** |
| | (0.15) | (0.15) | (0.17) | (0.13) | (0.14) | (0.14) |
| σ | 1.04*** | 1.44*** | 1.15*** | 1.25*** | 1.25*** | 1.44*** |
| | (0.18) | (0.11) | (0.16) | (0.09) | (0.07) | (0.07) |
| Animal Welfare * Workers welfare | | | | | | |
| μ | -0.18 | -0.07 | -0.13 | -0.14 | -0.15 | -10.80 |
| | (0.23) | (0.19) | (0.18) | (0.15) | (0.14) | (0.13) |
| ASC | | | | | | |
| μ | -4.29*** | -4.41*** | -4.27*** | -4.36*** | -4.27*** | -4.30*** |
| | (0.22) | (0.23) | (0.28) | (0.16) | (0.17) | (0.18) |

[22] Cholesky matrices are reported in Tables A2.4, A2.5, and A2.6 in the Appendix

**Table 2.7 (cont'd)**

| | | | | | | |
|---|---|---|---|---|---|---|
| Error Component | | | | | | |
| $\eta$ | 2.33*** | 2.09*** | 3.00*** | 2.25*** | 2.63*** | 2.56*** |
| | (0.21) | (0.19) | (0.27) | (0.14) | (0.16) | (0.15) |
| Price scale parameter | | | | | | |
| μ | -0.98*** | -1.09*** | -0.93*** | -1.04*** | -0.96*** | -1.01*** |
| | (0.02) | (0.03) | (0.02) | (0.02) | (0.02) | (0.02) |
| σ | 0.98*** | 1.09*** | 0.93*** | 1.04 | 0.96*** | 1.01*** |
| | (0.02) | (0.03) | (0.02) | (0.02) | (0.02) | (0.02) |
| **Treatment Effects[B]** | | | | | | |
| *Label Treatment* * Animal Welfare | | | | 0.49* | | |
| | | | | (0.20) | | |
| *Label Treatment* * Worker Welfare | | | | 0.10 | | |
| | | | | (0.15) | | |
| *Label & Media Treatment* * Animal Welfare | | | | | 0.50*** | 0.04 |
| | | | | | (0.17) | (0.20) |
| *Label & Media Treatment* * Worker Welfare | | | | | 0.24* | 0.16 |
| | | | | | (0.15) | (0.16) |
| **Model Statistics** | | | | | | |
| Number of Respondents | 253 | 258 | 251 | 511 | 504 | 509 |
| Number of Observations | 2024 | 2064 | 2008 | 4088 | 4032 | 4072 |
| Number of parameters | 11 | 11 | 11 | 13 | 13 | 13 |
| Log-likelihood function | -1473.67 | -1462.68 | -1438.60 | -2944.96 | -2916.67 | -2909.35 |
| AIC/N | 1.467 | 1.428 | 1.444 | 1.447 | 1.453 | 1.435 |
| BIC/N | 1.498 | 1.458 | 1.475 | 1.467 | 1.474 | 1.455 |

[A]Standard errors are in parentheses. [B]The treatment variable is always a dummy variable equaling 0 for the lower numbered (less information) treatment.

As with the egg study the coefficient on the opt-out option is always negative and statistically significant across all treatments, indicating that respondents rather purchase any of

the milk alternatives than not purchase. Again, like the egg experiment, the experimentally designed interaction term between the two labels is never statistically significant. This means that the labels are not complements or substitutes. On the other hand, the individual label coefficients are always positive and statistically significant across all treatments, which confirms $H_1$. As in the eggs study, the animal welfare label is preferred over the worker welfare label in all treatments, except in the *Control* where consumers are willing to pay, on average, $0.70 for both labels. This evidence confirms our hypothesis ($H_2$). In addition, there are slight differences between the relative magnitudes across treatments of both welfare labels, except in the *Control* where consumers, on average, are willing to pay $0.70 for both welfare labels. For instance, consumers are willing to pay $1.22 and $1.25 for the animal welfare label in the *Label* and *Label & Media* treatments, respectively. Similar patterns are observed for the worker welfare label for which consumers are, on average, willing to pay $0.78 and $0.96 in the *Label* and *Label & Media* treatments, respectively. These results confirm our third hypothesis ($H_3$); namely, consumer WTP increases when more information about both labels is provided to them. Finally, as in the eggs study, the coefficients of the standard deviations are significant for both labels, indicating substantial heterogeneity. The magnitude of these coefficients further indicates that the share of positive marginal WTPs for the Animal Welfare label is 73%, 94%, and 90% in the *Control, Labels,* and *Label & Media* treatments, respectively, while it is 75%, 71%, and 80% for the worker welfare label in the *Control, Labels,* and *Label & Media* treatments, respectively. Taken together, these results suggest there are differences in premiums for each label across treatment groups, confirming our third hypothesis (H3).

Hypothesis 3 is further evaluated, though, with the pooled models (Model-CL, Model-CLM, and Model-LLM) reported in the last 3 columns of Table 2.7. There also appears to be statistically significant differences in premiums for each label across the *Control* and the *Label*

and *Label & Media* treatment groups, expect for the worker welfare label between the *Contro*l and *Label* information treatments. To illustrate, the coefficients of the interaction terms between animal welfare and the *Label* and the *Label & Media* treatments are statistically significant in both the Model-CL and Model-CLM models ($0.49 and $0.50), confirming that providing consumers with label and media information increases an existing premium for the label. As for the worker label, only the interaction term in the CLM model is statistically significant ($0.24). As in the eggs study, none of the interaction terms in the Model-LLM are statistically significant.

### 2.5 Discussion and Policy Implications

This study provides an empirical investigation into consumers' WTP for a label certifying working conditions on eggs and milk compared to valuation for an animal welfare label, under different information settings. A hypothetical discrete choice experiment was designed for each product to answer the following four questions: (1) How does consumer willingness-to-pay (WTP) for eggs and milk vary in the presence or absence of animal welfare and worker welfare labels? (2) Which labeling scheme (animal welfare or worker welfare) do consumers prefer? (3) Are these labels substitutes or complements? And (4) How do consumer preferences for animal welfare and worker welfare change under different information settings?

The results from our MXL-EC models provide insights relevant for producers and policymakers. The first question addressed is whether worker welfare labels will be viable in animal-based food markets. Since the WTP estimates for the worker welfare label were always positive and statistically significant there is support that consumers would be willing to pay a price premium for animal-based products marketed with a worker welfare label. This suggests that the implementation of a labeling program on worker welfare may create new market opportunities for producers and agribusinesses. Additionally, labels certifying working

conditions may be a method of offsetting producer costs of improved working conditions by asking consumers to contribute to this cause. The finding that consumers are willing to pay a positive premium for a worker welfare label is consistent with Drichotis et al (2017) and Howard and Allen (2008) who conclude that European and U.S. consumers respectively are willing to pay a price premium for strawberries with a label certifying working conditions.

In addition to a positive WTP for worker welfare labels on animal-based food products in the U.S., our results indicate that consumers are willing to pay a positive price premium for animal welfare labels on eggs and milk, which confirms a number of prior studies' results. What is novel is that we can identify a relative ranking between animal welfare and worker welfare labels. Respondents consistently indicated a greater WTP for the animal welfare label than the worker welfare label which is consistent with prior studies in sociology (Howard, 2006; Howard and Allen, 2006, 2008, 2010). We do not profess to know the mechanism behind this ranking but posit a number of potential factors contributing to this relationship. First, the animal welfare labels used in these experiments are currently present in the market while the worker welfare label is not. Therefore, consumers may have positive prior experience, trust, and expectations surrounding the existing label compared to the unknown nascent one. Additionally, consumers may associate a halo effect with the animal welfare label that is not associated with the worker welfare label. Specifically, consumers may believe that enhanced animal welfare practices result in better animal-based food products, whereas no similar linkage between worker welfare practices and the product quality may be believed.[23] Independent of the cause behind this relationship, this suggests that producers and agribusinesses can achieve a greater price premium for animal welfare labels than worker welfare labels.

[23] The authors would like to thank Jie Li for this suggestion at the Agricultural and Applied Economics Association (AAEA) annual meeting 2019 in Atlanta, GA.

Further, our results indicate that consumers with the label definitions are willing to pay a greater premium than those without this prior knowledge (*Control*) as evidenced by the positive and statistically significant information treatment label interaction terms. However, there was no statistically significant observed difference in WTP between the *Label* and *Label & Media* treatment groups. This implies that as long as people know the definition of the label, additional information like a news article, does not affect their choice behavior. This result is similar to Berry, et al. (2017) who found that labeling alters purchase behavior but that a news article had no influence. Nevertheless, despite statistical significance price premiums for both labels did nominally increase under the news article treatment compared to label definitions alone so it may be worth exploring whether constructing a news article to better articulate and emphasize the label definition would increase the usefulness as media as a source of information propagation. Yet, the information effect should not be overlooked. Of statistically significant results the premium ranged from $0.24 to $0.50 for milk. Market milk prices in the year prior to the choice experiment were at one point as low as $0.39 (United States Department of Agriculture Agricultural Marketing Service, n.d.b), which suggests that the information treatment effect could approximately double the market price. Even at the conservative end of the highest price of $7.98 (United States Department of Agriculture Agricultural Marketing Service, N.D.b), a 3% expressed WTP difference may lead to sizably more revenue for a product with high purchase frequency.

Finally, there was a non-statistically significant result worth acknowledging, which is that the animal welfare and worker welfare labels are independent. There was no statistical evidence that these labels were substitutes or complements. Thus, like consumers, producers and agribusinesses interested in adopting either label ought to evaluate each label independently. They may decide that including both labels on their product is profitable but doing so does not

add any additional value than that provided by each separate label. To reiterate, when assessing each label on its own producers and agribusinesses will likely gravitate toward the animal welfare labels as consumers indicate a greater willingness to pay for them than worker welfare labels. Additionally, this label is already existing in the market and offers an immediate method of product differentiation. As such, some consumers may already be familiar with the label definition or more receptive to such information which could further increase their WTP for the labeled product. Results suggest that individuals responsible for managing welfare labeling programs may want to highlight the definition of their labeling program when strategizing about its effectiveness. The more information about the program that consumers are aware of the more likely they are to support it financially.

What policy implication can be drawn from the reults given that we've outlined the practical applications? A labeling program is only one option available to policymakers. The fact that consumers were willing to pay a premium for the worker welfare label and that this premium increased with more information posits that both producers and policymakers will want to track future changes in consumer attitudes toward agricultural working conditions. Producers do not want to face decreased demand or boycott, for example, due to losing the social license to produce from consumers. Additionally, policymakers could always force select minimum working conditions on the agricultural sector through legislation so it is worth exploring if they want external mandates and enforcement for working conditions or are happy to selectively support establishments strong in their working practices by purchasing differentiated (labeled) products in the market.

## 2.6 Conclusion

Recently labels certifying working conditions have entered the food market, but their application is limited geographically and by product type. For instance, to the authors' knowledge there are no worker welfare labels applied to animal-based food products. A feasible next step would be to create a certification program that verifies and communicates working conditions to consumers with a product label. Results suggest that consumers would be willing to pay a price premium for such labeled products. On the other hand, animal-based food producers may find animal welfare labeling programs more beneficial as their proliferation is greater and as consumers are willing to pay a greater premium than for worker welfare. It is possible that producers would want to participate in both animal and worker welfare labeling programs as consumers do not see these labels as substitutes, however there is also no complementarity premium to be gained by including both. A strategy that is successful in increasing the price premium is providing more information to consumers, although there may not be much additional value to using a media outlet versus simply ensuring awareness of the label definition.

Despite all that was learned from this study, which is the first to explore worker welfare labeling on animal-based products and to compare worker welfare and animal welfare preferences, there remain a number of unanswered questions. For instance, it is unclear why consumers prefer animal welfare labels over worker welfare labels. Qualitative studies exploring this question may provide additional insights to individuals pondering worker welfare labeling programs regarding their viability and competitiveness in food markets. Furthermore, another labeling system being pondered in regards to worker welfare is domestic fair trade. Future studies should investigate whether domestic fair trade may garnish a greater premium than the fair labor label introduced here, or its contemporaries in the Equitable Food Initiative and Fair Food Program. Finally, as it was revealed that consumers are willing to pay a premium for

animal-based food products with a label certifying worker conditions, it is necessary to review the current state of working conditions in these industries, identify areas for improvement, and estimate the costs associated with implementing such changes in comparison to the potential premium. From such studies, farms may find that they have already adopted recommended practices that they may be able to capitalize on in the market if communicated to consumers either through adoption of a labeling system, or perhaps via other marketing means. More research is needed on whether consumers' provision to farmers of the social license to produce has evolved to incorporate working conditions, and if so, which conditions are expected and how consumers want this information to be monitored and reported.

# APPENDIX

## APPENDIX

**Exhibit A2.1** Egg Choice Experiment Directions

*Egg Choice Questions (Seen by all treatments)*

In this section you will be faced with 8 choice questions about eggs.

Before recording your responses, carefully read the following information which will assist you in completing the questions that follow about egg purchase decisions. Note that the button to advance is set to appear based on a timer to encourage your thoughtful reading.

Each question presents two different dozen Brown Large Grade A egg products and a no-purchase option. The egg products vary with regard to price and the presence or absence of two labels (Fair Labor and Accredited Cage Free).


**Fair Labor**


**Accredited Cage Free**

All other potential egg attributes that are not explicitly reported in the product profiles (questions) are identical across options. For each choice question, please choose the egg product you would prefer to purchase. Alternatively you may choose NOT TO PURCHASE any product. Please carefully examine each option before you make a decision and choose the product that you most prefer.

Before you proceed, we would like to remind you that although the egg questions are hypothetical (that is, you will not actually have to pay for the product), you should answer as if you were actually buying the product at a retailer. Thus, before making your selection, consider whether you would actually be willing to pay the listed price, meaning that you would no longer have that amount available for purchases. Also, keep in mind that the results of this survey will be available to farmers, producers, retailers, and policymakers, as well as to the wider general public of consumers. This means that this survey could affect the decisions of farmers, producers, retailers, and policymakers regarding new product adoption.

**Exhibit A2.1 (cont'd)**

*Egg Low information (Seen by Treatments 2 and 3)*

With the above in mind, please read carefully the meaning of the labels that will be presented and a relevant news article.

Animal products with the Fair Labor label are produced from farms that maintain an established minimum level of protection for the human rights of workers. A few examples of these rights include receipt of a set minimum wage and provision of proper safety equipment during production. Compliance is verified by employees from other participating farms.


Animal products with the Accredited Cage Free label are produced by laying hens that are raised uncaged and are free to walk, nest, and engage in other natural behaviors. Farmers assert production methods meet such standards however there is no third party compliance verification.

**Exhibit A2.1 (cont'd)**

*Egg Explicit Information (Seen by Treatment 3)*

# A NEW FOOD PRODUCT LABEL TO WATCH: FAIR LABOR

Little is known about the working conditions of livestock workers but that is changing. There are reports indicating that many workers work 60 or more hours per week, some for below minimum wage, many without overtime rate adjustments (as some farms are exempt from the national minimum wage and overtime requirement of the Fair Labor Standards Act). Additionally, workers often do not receive health, vision, or dental insurance from their employer, and may be reluctant to file for workers' compensation for injuries received on the job for risk of retaliation. Finally, their working conditions may exasperate health problems.

These conditions have led some individuals to discuss the potential implementation of worker welfare labels which will signal to consumers that the basic needs of workers have been attended to in the production process. One such label could be the Fair Labor label. The Fair Labor labeling program ensures that workers of participating farms receive a set minimum wage and are provided necessary safety equipment to safely perform their jobs.

The concept of the worker welfare label is similar to animal welfare labeling programs. For at least the last decade animal welfare has been a hot policy issue, even making the ballots of some states. These welfare initiatives have included development of labeling programs which help signal to consumers animal welfare practices used on farm, that are otherwise unknown to the consumer from looking at the product. For example, cage free environments have been deemed the best for laying hens. As such many animal welfare labels, like Accredited Cage Free, certify these preferred standards for laying hens.

However, researchers in the Coalition for a Sustainable Egg Supply found that livestock practices recommended to improve the quality of life of animals, may actually be impairing the health of workers. Cage free environments increase the dust and thus pathogens in the air exasperating worker respiratory systems compared to outdoor or caged chicken environments. Additionally, eggs are often buried beneath roaming chickens and bedding resulting in strain on workers when stooping.

Whether the Fair Labor label gains the same traction in the market as animal welfare related labels remains to be seen, but for now it raises important questions about human conditions for both animals and workers in egg production


**Figure A2.1** Example Egg Choice Question

**Table A2.1** Cholesky Matrix from Model-C estimates, Eggs Study

| | *AW* | *WW* | *Err. Comp* |
|---|---|---|---|
| *AW* | **1.01180** | | |
| *WW* | **0.68069** | 0.33489 | |
| *Err.Comp.* | **1.93096** | -2.77504 | **1.67482** |

*Parameters in bold are statistically significant at the 95% level or better.

**Table A2.2.** Cholesky Matrix from Model-L estimates, Eggs Study

| | *AW* | *WW* | *Err. Comp* |
|---|---|---|---|
| *AW* | **1.43733** | | |
| *WW* | **-0.34285** | **0.58470** | |
| *Err.Comp.* | -0.34285 | **-2.13458** | **2.87279** |

*Parameters in bold are statistically significant at the 95% level or better.

**Table A2.3** Cholesky Matrix from Model-LM estimates, Eggs Study

| | *AW* | *WW* | *Err. Comp* |
|---|---|---|---|
| *AW* | **1.64782** | | |
| *WW* | **-0.52842** | **1.11328** | |
| *Err.Comp.* | -0.24443 | **0.86399** | **2.59222** |

*Parameters in bold are statistically significant at the 95% level or better.


**Figure A2.2** Example Gallon Milk Choice Question

**Exhibit A2.2** Milk Choice Experiment Directions

*Milk Choice Experiment Directions (Seen by all treatments)*

**Milk Choice Questions**
In this section you will be faced with 8 choice questions about milk.

Before recording your responses, carefully read the following information which will assist you in completing the questions that follow about milk purchase decisions. Note that the button to advance is set to appear based on a timer to encourage your thoughtful reading.

Each question presents two different milk products and a no-purchase option. The milk products vary with regard to price and the presence or absence of two labels (Fair Labor and Animal Welfare Approved).


**Fair Labor**


**Animal Welfare Approved**

All other potential milk attributes that are not explicitly reported in the product profiles (questions) are identical across options. For each choice question, please choose the milk product you would prefer to purchase. Alternatively you may choose NOT TO PURCHASE any product. Please carefully examine each option before you make a decision and choose the product that you most prefer.

Before you proceed, we would like to remind you that although the milk questions are hypothetical (that is, you will not actually have to pay for the product), you should answer as if you were actually buying the product at a retailer. Thus, before making your selection, consider whether you would actually be willing to pay the listed price, meaning that you would no longer have that amount available for purchases. Also, keep in mind that the results of this survey will be available to farmers, producers, retailers, and policymakers, as well as to the wider general public of consumers. This means that this survey could affect the decisions of farmers, producers, retailers, and policymakers regarding new product adoption.

**Exhibit A2.2 (cont'd)**

*Milk Low information (Seen by Treatments 2 and 3)*

With the above in mind, please read carefully the meaning of the labels that will be presented and a relevant news article.

Animal products with the Fair Labor label are produced from farms that maintain an established minimum level of protection for the human rights of workers. A few examples of these rights include receipt of a set minimum wage and provision of proper safety equipment during production. Compliance is verified by employees from other participating farms.


Animal products with the Animal Welfare Approved label are produced by animals that are raised outdoors on pasture or range for their entire lives. Farmers use additional high-welfare farming practices to meet animal care standards, developed in collaboration with scientists, veterinarians, researchers, and farmers from across the globe. Compliance is verified with farm visits at least once a year by independent trained auditors.

**Exhibit A2.2 (cont'd)**

*Milk Explicit Information (Seen by Treatment 3)*

## A NEW FOOD PRODUCT LABEL TO WATCH: FAIR LABOR

Little is known about the working conditions of livestock workers but that is changing. There are reports indicating that many milkers work 60 or more hours per week, some for below minimum wage, many without overtime rate adjustments (as some farms are exempt from the national minimum wage and overtime requirements of the Fair Labor Standards Act). Additionally, workers often do not receive health, vision, or dental insurance from their employer, and may be reluctant to file for workers' compensation for injuries received on the job for risk of retaliation.

These conditions have led some individuals to discuss the potential implementation of worker welfare labels which will signal to consumers that the basic needs of workers have been attended to in the production process. One such label could be the Fair Labor label. The Fair Labor labeling program ensures that workers of participating farms receive a set minimum wage and are provided necessary safety equipment to safely perform their jobs.

The concept of the worker welfare label is similar to animal welfare labeling programs. For at least the last decade animal welfare has been a hot policy issue, even making the ballots of some states. These welfare initiatives have included development of labeling programs which help signal to consumers animal welfare practices used on farm, that are otherwise unknown to the consumer from looking at the product. For example, the Animal Welfare Approved labeling program sets guidelines on the care of dairy cattle that include the prohibition of tethering, continuous access to outdoor pasture, and a diet high in long fiber roughage/forage. Thus, animal welfare efforts have paid attention to multiple dimensions, including pain management, range of movement, and diet, of wellbeing.

Some individuals assert that the parallel needs of workers are not always being met at the farm. Whether the Fair Labor label gains the same traction in the market as animal welfare related labels remains to be seen, but for now it raises important questions about minimum working conditions in milk production.

**Table A2.4** Cholesky Matrix from Model-C estimates, Milk Study

| | *AW* | *WW* | *Err. Comp* |
|---|---|---|---|
| *AW* | **1.13993** | | |
| *WW* | **-0.46763** | **0.92896** | |
| *Err.Comp.* | 0.41383 | 0.06097 | **2.29378** |

*Parameters in bold are statistically significant at the 95% level or better.

**Table A2.5** Cholesky Matrix from Model-L estimates, Milk Study

| | *AW* | *WW* | *Err. Comp* |
|---|---|---|---|
| *AW* | **1.76732** | | |
| *WW* | **-41398** | **1.38226** | |
| *Err.Comp.* | -0.31690 | **0.54585** | **1.99373** |

*Parameters in bold are statistically significant at the 95% level or better.

**Table A2.6** Cholesky Matrix from Model-LM estimates, Milk Study

| | *AW* | *WW* | *Err. Comp* |
|---|---|---|---|
| *AW* | **1.37926** | | |
| *WW* | **0.54110** | **1.34154** | |
| *Err.Comp.* | **-1.19176** | 0.31598 | **2.73782** |

*Parameters in bold are statistically significant at the 95% level or better.

# REFERENCES

## REFERENCES


Aarnio, K., Lindeman, M., 2004. Magical food and health beliefs: a portrait of believers and functions of the beliefs. Appetite 43, 65–74. https://doi.org/10.1016/j.appet.2004.03.002

Akaichi, F., Glenk, K., Revoredo-Giha, C., 2019. Could animal welfare claims and nutritional information boost demand for organic meat? Evidence from non-hypothetical experimental auctions. Journal of Cleaner Production 961–970. https://doi.org/10.1016/j.jclepro.2018.10.064

Andersen, L.M., 2011. Animal Welfare and Eggs – Cheap Talk or Money on the Counter? Journal of Agricultural Economics 62, 565–584. https://doi.org/10.1111/j.1477-9552.2011.00310.x

Aprile, M.C., Caputo, V., Nayga, R.M., 2012. Consumers' valuation of food quality labels: the case of the European geographic indication and organic farming labels. International Journal of Consumer Studies 36, 158-165.

Auger, P., Devinney, T.M., Louviere, J.J., 2007. Using Best–Worst Scaling Methodology to Investigate Consumer Ethical Beliefs Across Countries. J Bus Ethics 70, 299–326. https://doi.org/10.1007/s10551-006-9112-7

Bazzani, C., Caputo, V., Nayga, R.M., Canavari, M., 2017. Revisiting consumers' valuation for local versus organic food using a non-hypothetical choice experiment: Does personality matter? Food Quality and Preference 62, 144-154.

Bazzani, C., Caputo, V., Nayga, R.M., Canavari, M., 2017. Testing Commitment Cost Theory in Choice Experiments. Economic Inquiry 55, 383–396. https://doi.org/10.1111/ecin.12377

Bennett, R.M., 1997. Farm animal welfare and food policy. Food Policy 22, 281–288. https://doi.org/10.1016/S0306-9192(97)00019-5

Bennett, R.M., Blaney, R.J.P., 2003. Estimating the benefits of farm animal welfare legislation using the contingent valuation method. Agricultural Economics 29, 85–98. https://doi.org/10.1016/S0169-5150(03)00037-9

Berry, C., Burton, S., Howlett, E. 2017. It's Only Natural: The Mediating Impact of Consumers' Attribute Inferences on the Relationships between Product Claims, Perceived Product Healthfulness, and Purchase Intentions. Journal of the Academy of Marketing Science 45, 698–719.

Bhat, C.R., 2003. Simulation estimation of mixed discrete choice models using randomized and scrambled Halton sequences. Transportation Research Part B: Methodological 37, 837–855.

Brooks, K., Lusk, J.L., 2010. Stated and Revealed Preferences for Organic and Cloned Milk: Combining Choice Experiment and Scanner Data. American Journal of Agricultural Economics 92, 1229–1241.

Caliendo, M., Fossen, F.M., Kritikos, A.S., 2009. Risk attitudes of nascent entrepreneurs–new evidence from an experimentally validated survey. Small Bus Econ 32, 153–167. https://doi.org/10.1007/s11187-007-9078-6

Caputo, V. 2020. Does Information on Food Safety Affect Consumers' Acceptance of New Food Technologies? The case of irradiated beef in South Korea under a new labeling system and across different information regimes. Australian Journal of Agricultural and Resource Economics 59:1–31.

Caputo, V., Lusk, J.L., Nayga, R.M., 2020. Am I Getting a Good Deal? Reference Dependent Decision Making When the Reference Price Is Uncertain. American Journal of Agricultural Economics 102, 132-153. https://doi.org/10.1093/ajae/aaz042

Caputo, V., Lusk, J.L., Nayga, R.M., 2018. Choice experiments are not conducted in a vacuum: The effects of external price information on choice behavior. Journal of Economic Behavior & Organization 145, 335–351. https://doi.org/10.1016/j.jebo.2017.11.018

Caputo, V., Nayga, R.M., Scarpa, R., 2013. Food miles or carbon emissions? Exploring labelling preference for food transport footprint with a stated choice study. 57, 465-482.

Caputo, V., Scarpa, R., Nayga Jr., R.M., 2017. Cue versus independent food attributes: the effect of adding attributes in choice experiments. European Review of Agricultural Economics 44, 211–230. https://doi.org/https://doi-org.proxy1.cl.msu.edu/10.1093/erae/jbw022

Caputo, V. Vassilopoulos, A., Nayga, R.M., Canavari, M., 2013. Welfare Effects of Food Miles Labels. The Journal of Consumer Affairs 47, 311-327.

Caswell, J. A., and Mojduszka, E.M., 1996. 'Using Informational Labeling to Influence the Market for Quality in Food Products. American Journal of Agricultural Economics 78, 1248–1253.

Chang, J.B., Lusk, J.L., Norwood, F.B., 2010. The Price of Happy Hens: A Hedonic Analysis of Retail Egg Prices. Journal of Agricultural and Resource Economics 35, 406–423.

Chang, J.B., Lusk, J.L., Norwood, F.B., 2009. How Closely Do Hypothetical Surveys and Laboratory Experiments Predict Field Behavior? American Journal of Agricultural Economics 91, 518–534.

Coalition for Sustainable Egg Supply, n.d. Final Research Results Report.

Conner, D., Irwin, E., Simmen, M., 2018. Exploring demand for eco-labeled dairy product attributes in Vermont. British Food Journal 120, 2857–2867. https://doi.org/10.1108/BFJ-05-2018-0305

Costanigro, M., McFadden, D.T., Kroll, S., Nurse, G., 2011. An in-store valuation of local and organic apples: the role of social desirability. Agribusiness 27, 465–477. https://doi.org/10.1002/agr.20281

Crespi, J.M., Lusk, J.L., Cherry, J.B.C., Martin, L.E., Mcfadden, B.R., Bruce, A.S., 2016. Neural Activations Associated with Decision-Time and Choice in a Milk Labeling Experiment. American Journal of Agricultural Economics 98, 74–91. https://doi.org/10.1093/ajae/aav049

de-Magistris, T., Gracia, A., Nayga, R.M., 2013. On the Use of Honesty Priming Tasks to Mitigate Hypothetical Bias in Choice Experiments. American Journal of Agricultural Economics 95, 1136–1154.

Doyon, M., Bergeron, S., Cranfield, J., Tamini, L., Criner, G., 2016. Consumer Preferences for Improved Hen Housing: Is a Cage a Cage?: PRIORITY EFFECTS ON PREFERENCES FOR HEN HOU.S.ING. Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie 64, 739–751. https://doi.org/10.1111/cjag.12113

Drichoutis, A.C., Vassilopoulos, A., Lusk, J.L., Nayga, R.M., 2017. Consumer preferences for fair labour certification. European Review of Agricultural Economics 44, 455–474. https://doi.org/10.1093/erae/jbx002

Gerini, F., Alfnes, F., Schjoll, A., 2016. Organic- and Animal Welfare-labelled Eggs: Competing for the Same Consumers? J. Agric. Econ. 67, 471–490. https://doi.org/10.1111/1477-9552.12154

Gifford, K., and J.C. Bernard. 2011. The Effect of Information on Consumers' Willingness to Pay for Natural and Organic Chicken. International Journal of Consumer Studies 35, 282–89.

Greene, W.H., Hensher, D.A., 2003. A latent class model for discrete choice analysis: contrasts with mixed logit. Transportation Research Part B: Methodological 37, 681–698.

Heng, Y., Peterson, H.H., 2018. Interaction Effects among Labeled Attributes for Eggs in the United States. Journal of International Food & Agribusiness Marketing 30, 236–250. https://doi.org/10.1080/08974438.2017.1413610

Heng, Y., Peterson, H.H., Li, X., 2013. Consumer Attitudes toward Farm-Animal Welfare: The Case of Laying Hens. Journal of Agricultural and Resource Economics 38, 418–434.

Howard, P.H., 2006. Central Coast consumers want more food-related information, from safety to ethics. California Agriculture 60, 14–19.

Howard, P.H., Allen, P., 2010. Beyond Organic and Fair Trade? An Analysis of Ecolabel Preferences in the United States. Rural Sociology 75, 244–269. https://doi.org/10.1111/j.1549-0831.2009.00009.x

Howard, P.H., Allen, P., 2008. Consumer willingness to pay for domestic “fair trade”: Evidence from the United States. Renewable Agriculture and Food Systems; Cambridge 23, 235–242. https://doi.org/http://dx.doi.org.proxy1.cl.msu.edu/10.1017/S1742170508002275

Howard, P.H., Allen, P., 2006. Beyond organic: consumer interest in new labelling schemes in the Central Coast of California. International Journal of Consumer Studies 30, 439–451. https://doi.org/10.1111/j.1470-6431.2006.00536.x

Kendall, H.A., Lobao, L.M., Sharp, J.S., 2006. Public Concern with Animal Well-Being: Place, Social Structural Location, and Individual Experience*. Rural Sociology; Columbia 71, 399–428. https://doi.org/http://dx.doi.org.proxy2.cl.msu.edu/10.1526/003601106778070617

Karcher, D.M., Jones, D.R., Abdo, Z., Zhao, Y., Shepherd, T.A., Xin, H., 2015. Impact of commercial housing systems and nutrient and energy intake on laying hen performance and egg quality parameters. Poultry Science 94, 485–501. https://doi.org/10.3382/ps/peu078

Lancaster, K.J., 1966. A New Approach to Consumer Theory. Journal of Political Economy 74, 132–157.

Lee, S.H., Han, D.B., Caputo, V., Nayga, R.M., 2015. Consumers’ Valuation for a Reduced Salt Product: A Nonhypothetical Choice Experiment 63, 563-582.

Lin, W., Ortega, D.L., Caputo, V., 2019. Are Ex-Ante Hypothetical Bias Calibration Methods Context Dependent? Evidence from Online Food Shoppers in China. Journal of Consumer Affairs 53, 520–544. https://doi.org/10.1111/joca.12202

Lusk, J.L., 2019. Consumer preferences for cage-free eggs and impacts of retailer pledges. Agribusiness 35, 129–148. https://doi.org/10.1002/agr.21580

Lusk, J.L., House, L.O. Valli, C., Jaeger, S.R., Moore, M. J. L. Morrow, and W. B. Traill. 2004. Effect of Information about Benefits of Biotechnology on Consumer Acceptance of Genetically Modified Food: Evidence from Experimental Auctions in the United States, England, and France. European Review of Agricultural Economics 31, 179–204

Lusk, J.L., J. Roosen, and J. Fox., 2003. Demand for Beef from Cattle Administered Growth Hormones or Fed Genetically Modified Corn: A Comparison of Consumers in France, Germany, the United Kingdom, and the United States. American Journal of Agricultural Economics 85. 16–29.

Lusk, J.L., Schroeder, T.C., 2004. Are Choice Experiments Incentive Compatible? A Test with Quality Differentiated Beef Steaks. American Journal of Agricultural Economics 86, 467–482.

McFadden, D., 1974. "Conditional Logit Analysis of Qualitative Choice Behavior". In P. Zarembka (Ed.), Frontiers in Econometrics (pp. 105–142). New York: Academic Press.

McFadden, J.R., and W.E. Huffman. 2017. Willingness-to-Pay for Natural, Organic, and Conventional Foods: The Effects of Information and Meaningful Labels. Food Policy 68, 214–32.

Norwood, F.B., Lusk, J.L., 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. https://doi.org/10.1016/j.jeem.2011.04.001

Ochs, D.S., Wolf, C.A., Widmar, N.J.O., Bir, C., 2018. Consumer perceptions of egg-laying hen housing systems. Poultry Science 97, 3390–3396. https://doi.org/10.3382/ps/pey205

Olynk, N.J., Tonsor, G.T., Wolf, C.A., 2010. Consumer Willingness to Pay for Livestock Credence Attribute Claim Verification. Journal of Agricultural and Resource Economics 35, 261–280.

Onozaka, Y., Mcfadden, D.T., 2011. Does Local Labeling Complement or Compete with Other Sustainable Labels? A Conjoint Analysis of Direct and Joint Values for Fresh Produce Claim. American Journal of Agricultural Economics 93, 693-706. https://doi.org/10.1093/ajae/aar005

Paul, A.S., Lusk, J.L., Norwood, F.B., Tonsor, G.T., 2019. An experiment on the vote-buy gap with application to cage-free eggs. Journal of Behavioral and Experimental Economics 79, 102–109. https://doi.org/10.1016/j.socec.2019.02.005

Revelt, D., Train, K., 1998. Mixed Logit with Repeated Choices: Households' Choices of Appliance Efficiency Level. The Review of Economics and Statistics 80, 647–657. https://doi.org/10.1162/003465398557735

Rolfe, J., 1999. Ethical Rules and the Demand for Free Range Eggs. Economic Analysis and Policy 29, 187–206. https://doi.org/10.1016/S0313-5926(99)50020-9

Rousu, M., Huffman, W.E., Shogren, J.F., Tegene, A., 2007. Effects and Value of Verifiable Information in a Controversial Market: Evidence from Lab Auctions of Genetically Modified Food. Economic Inquiry 45, 409–432. https://doi.org/10.1111/j.1465-7295.2007.00017.x

Scarpa R, Campbell D, Hutchinson G (2007) Benefit estimates for landscape improvements: Sequential Bayesian design and respondents rationality in a choice experiment. Land Economics 83(4), 617–634.

Scarpa, R., Ferrini, S., Willis, K., 2005. Performance of Error Component Models for Status-Quo Effects in Choice Experiments, in: Scarpa, R., Alberini, A. (Eds.), Applications of Simulation Methods in Environmental and Resource Economics, The Economics of Non-Market Goods and Resources. Springer Netherlands, Dordrecht, pp. 247–273.

Scarpa, R., Thiene, M., Train, K. 2008. Utility in Willingness to Pay Space: A Tool to Address Confounding Random Scale Effects in Destination Choice to the Alps. Amer. J. Agr. Econ. 90, 994-1010.

Scheiber, N., 2017. Ben & Jerry's Strikes Deal to Improve Migrant Dairy Workers' Conditions. The New York Times.

Tonsor, G.T.,Olynk, N., and Wolf, C. 2009. Consumer Preferences for Animal Welfare Attributes: The Case of Gestation Crates. Journal of Agricultural and Applied Economics, 41. 713–730.

Train, K.E., 2009. Discrete Choice Methods with Simulation, 2nd ed. Cambridge University Press.

United States Department of Agriculture Agricultural Marketing Service. N.D.a "Report Results for Retail: Weekly Advertised Poultry Retail Prices" Accessed Nov. 28, 2018 https://www.marketnews.usda.gov/mnp/py-report-retail?runReport=true&portal=py&startIndex=1&commodity=EGGS&class=Retail&repType=summary&region=ALL&type=ALL&state=ALL&description=ALL&dataType=None+Selected&operator=%3C&dataValue=&repDate=12%2F01%2F2017&endDate=11%2F23%2F2018

United States Department of Agriculture Agricultural Marketing Service. N.D.b "Report Results for Retail: Weekly Advertised Retail Prices" Accessed Nov. 28, 2018 https://www.marketnews.usda.gov/mnp/da-report-retail?repType=wiz&run=Run&portal=da&locChoose=locState&commodityClass=allcommodity&startIndex=1&type=retail&class=MILK&commodity=ALL&packSize=GALLON&region=ALL&organic=ALL&repDate=12%2F01%2F2017&endDate=11%2F23%2F2018&compareLy=No

Valente, M., Chaves, C., 2018. Perceptions and valuation of GM food: A study on the impact and importance of information provision. Journal of Cleaner Production 172, 4110–4118. https://doi.org/10.1016/j.jclepro.2017.02.042

Van Loo, E.J., Caputo, V., Nayga Jr., R.M., Meullenet, J., Ricke, S.C., 2011. Consumers' willingness to pay for organic chicken breast: Evidence from choice experiment 22, 603-613.

Van Loo, E.J., Caputo, V., Nayga Jr., R.M., Seo, H., Zhang, B., Verbeke, W., 2015. Sustainability labels on coffee: Consumer preferences, willingness-to-pay and visual attention to attributes 118, 215-225.

Van Loo, E.J., Caputo, V., Nayga Jr., R.M., Verbeke, W., 2014. Consumers' valuation of sustainability labels on meat. Food Policy 49, 137–150. https://doi.org/10.1016/j.foodpol.2014.07.002

Van Wezemeal, L., Caputo, V., Nayga, R.M., Chryssochoidis, G., Verbeke, W., 2014. European consumer preferences for beef with nutrition and health claims: A multi-country investigation using discrete choice experiments 44, 167-176.

Wolf, C.A., Tonsor, G.T., Olynk, N.J., 2011. Understanding U.S. Consumer Demand for Milk Production Attributes. Journal of Agricultural and Resource Economics 36, 326–342.

# ESSAY 3: WHICH CAME FIRST: THE CHICKEN (COW) OR THE LABORER? THE U.S. PUBLIC'S ATTITUDES TOWARD ANIMAL AND WORKER WELFARE

## 3.1 Introduction

Via their purchase behavior consumers grant a social license to food producers. If food does not meet their social acceptability requirements consumers will not purchase the product. Over time, it seems that the number of social responsibility attributes has increased including production practices like organic and related to animal welfare, as well as organic, locally sourced and others. Recently, in addition to these varied policy areas, expectations have been introduced regarding the treatment of agricultural workers. For example, even before moving toward less antibiotic chicken (Storm, 2015), McDonald's had partnered with the Fair Food program to purchase tomatoes from farms with certified working conditions (Fair Food Program, n.d.). Aramark and Walmart made similar worker welfare commitments before select public animal welfare stances (Aramark, 2015; Walmart, 2015; Fair Food Program, n.d..). As the Fair Food Program label and its contemporaries like the Equitable Food Initiative become more common in food markets and some writers suggest there are poor conditions, the nation's call for better working conditions for agricultural workers may grow (Greenhouse, 2015).

A gap in the literature is whether the public views animal and worker welfare as complementary concepts both striving to improve the wellbeing of living creatures while monitoring and enforcing ethical production practices in agriculture or perceive a trade-off between the two types of farm practices. We seek to fill this gap. Beyond public perception, there is some evidence suggesting an explicit tradeoff between animal and worker wellbeing in the implementation of farm practices. For example, in poultry production, physiologically cage-free systems are better for hens than aviaries, but worker respiratory systems are taxed more in

cage-free environments (Coalition for Sustainable Egg Supply, n.d.). Despite the plethora of research on non-cage production systems in the poultry industry both in terms of their impact on animal wellbeing (Regmi, et al. 2016; Regmi, et al. 2015) and consumers' preferences for such systems (Chang, et al. 2010; Heng, et al. 2013; Lusk 2019; Lusk 2010; Malone and Lusk 2016), discussion on the worker health impacts in such environments remains sparse (Coalition for Sustainable Egg Supply, n.d.). [24] More generally, compared to debates around animal welfare, attention to worker welfare in animal production is lacking. There have been a number of ballot initiatives related to animal welfare practices in agriculture, such as Proposition 2 in California, but no similar ballot initiatives related to agricultural labor to date in the U.S.. Nevertheless, examples like the work by Migrant Justice, including the adoption of the Milk with Dignity program by Ben & Jerry's, suggests some individuals opine that potential areas for improvement regarding an agricultural worker population exist (Scheiber 2017).

To address the lack of information on consumer's attitudes toward worker welfare impacting practices in the farm industry, we surveyed over 1,300 U.S. individuals. A best-worst scaling (BWS) approach was utilized to measure the U.S. public's preferences for various animal and worker welfare enhancing farm practices in the dairy and poultry industries. The dairy industry was selected because it is one of the most contemporaneous sectors discussing worker welfare conditions; the poultry industry was selected because of the potential explicit tradeoff between animal and worker welfare mentioned previously. Selected farm practices in these sectors focused on breaks and meals, third-party verification of conditions, and varied health

[24] Note that for the purposes of this study we are assuming cage-free systems to be better for hen health. However, we do acknowledge that there is no consensus on this issue. For example, mortality rates may be higher in cage-free environments and producers have a number of questions to address to make this system as productive and healthy as others (5 questions about cage-free hen health, welfare 2017).

concerns for both animals and workers. Additionally, two policies that simultaneously improve animal and worker welfare, training of workers (dairy) and worker to animal ratios (poultry), were also examined. Exploring these policies with a BWS experiment allowed for a relative ranking of both worker welfare and animal welfare practices.

Understanding how the U.S. public makes tradeoffs between animal and worker welfare enhancing practices is a question of great interest for various stakeholders, including farmers and policymakers. For instance, up to now, little attention has been paid to what worker welfare practices are considered most important to consumers. Furthermore, questions on whether producers should continue to prioritize animal welfare practices over worker welfare practices remain unanswered. It is important for producers to know the welfare practices most important to consumers to ensure their products comply with such standards and remain in demand given consumers' social license to produce. This is because as consumers the public advocates for production practices with the purchases they make; they may boycott products they believe are produced unethically and/or be willing to pay a price premium for verification that specific practices are used. In addition, producers may be limited in their ability to economically implement all possible animal and worker welfare enhancing practices without pricing themselves out of the market. Hence, evidence on what animal and worker welfare practices are most important to consumers is crucially important to make informed farm decisions. Further, policymakers must decide on labor standards in laws such as the Fair Labor Standards Act. These laws also at times exclude agriculture, like the overtime pay requirement in the Fair Labor Standards Act. Thus, policymakers need to understand not only broad opinion on working condition regulations, but also specifics of agricultural labor. Such decisions ensure worker safety while balancing the need for continued vitality of industry production. It is possible that

stronger enforcement of worker breaks, which is one practice explored in this study, is valued by the public and should be instituted. Without asking their constituents for their opinions on working conditions in agriculture, however, policymakers are operating with impartial information.

We contribute to the existing literature by introducing worker welfare enhancing practices. While there are several studies focusing on animal welfare improvements (Bennett 1997; Bennett and Blaney 2003; Ellison, et al. 2013; Heng, et al. 2013; McKendree, et al. 2018; McKendree, et al. 2014; Wolf and Tonsor 2017; Wolf and Tonsor 2013), this is the first study to our knowledge that explores worker welfare improvements. Second, not only does this study facilitate discussion for this nascent topic area, but it situates that discussion in the current public discourse on related farm practices. A separate ongoing discussion in research is the need for replication studies to act as robustness checks and validate existing research. By including animal welfare enhancing practices that have been explored in previous studies, we can comment on how the relative ranking of those farm practices is maintained or varies in this study. Similar rankings would strengthen the evidence in support of practice rankings while divergent rankings would suggest areas for future research in replicating animal welfare practice rankings, particularly in the context of other industry relevant topics like worker welfare or environmental sustainability.

Our results indicate that there are approximately four defined groups in each of the dairy and poultry samples with distinct preference structures. The largest group, containing over 50% of the sample population, in the dairy study ranked training programs for workers as the most important farm practice. For the poultry industry, the most important farm practices were treatment of sick animals and hen access to food and water.

The paper proceeds as follows. The first section describes the context and the farm policy selection in first the dairy industry and then the poultry industry. The second section describes the survey and research methodology, while section three summarizes the data. Next, we discuss the results beginning with the dairy study and finishing with the poultry study. Then we discuss the implications of the results before summarizing them in the conclusion.

### 3.2 Background and Farm Practice Identification

Prior studies have explored preferences for animal welfare practices in the dairy (Ellison, et al. 2013; Wolf and Tonsor, 2017; Wolf and Tonsor, 2013) and poultry (Bennett, 1997; Bennett and Blaney, 2003; Ellison, et al. 2013; Heng, et al. 2013) industries. However, no prior research has focused on the association between the public's preferences for practices that improve both animal and worker welfare.

This study considers this association within the context of the dairy and poultry industries. The dairy industry faces controversy surrounding the working conditions on some farms (Scheiber 2017; Greenhouse, 2015). Due in part to these national discussions, the National Dairy Farm Program extended their areas of concentration to include workforce development in 2018 (National Dairy Farm Program 2020). As they continue to refine what practices should be recommended in this program and as producers decide whether it is a program they would like to participate in, it is advantageous to have public opinion data on worker welfare farm practices in the dairy industry. The poultry industry has not received the same type of national attention regarding its working conditions. However, laws concerning animal welfare, like California's Proposition 2, are commonly up for debate. Therefore, the poultry industry serves as an interesting context for understanding how worker welfare concerns may fit within already well-

established concerns for animal welfare. Additionally, prior research suggests explicit tradeoffs may exist between animal and worker welfare in the poultry industry. For example, the Coalition for Sustainable Egg Supply (n.d) posits that cage-free aviary systems improve hen health but can depress worker respiratory health compared to conventional caged systems. As such we used these two industries and formulated farm animal and worker welfare practices for each. The following subsections describe the farm practice selection in each industry.

### *3.2.1 Dairy Industry*

While the initial experiment idea was inspired by Coalition for Sustainable Egg Supply (n.d.) and Scheiber (2017), the practical work of choosing the farm practices began with the dairy industry animal welfare practices reported in Wolf and Tonsor (2017). Using their nine animal welfare practices as a base, we brainstormed parallel worker welfare practices to elicit tradeoffs between animal welfare and worker welfare enhancements. Not all animal welfare practices were deemed to have worker welfare equivalents, while one, training of farm workers in cow handling was deemed to benefit both animals and workers. The final list was reduced to nine farm practices listed in Table 3.1 to keep the BWS experiment manageable for participants. The nine farm practices include four animal welfare practices, four worker welfare practices, and one practice benefiting both parties. The four practices primarily benefiting a single party (animal or workers) can be categorized as pertaining to i) breaks, ii) third-party verification, iii) treatment of sick, and iv) health plans.

**Table 3.1** Animal and Worker Welfare Practices in the Dairy Industry Included in this Study

| | Animal Welfare Practice | Worker Welfare Practice |
|---|---|---|
| Breaks | | |
| | *AW_breaks:* All cattle must have access to outdoor exercise areas for at least 4 hours per day, weather permitting. | *WW_breaks:* All workers are provided paid 15 minute breaks for every 4 hours worked, and a half hour (meal) break between each 4 hour shift. |
| Third-Party Verification | | |
| | *AW_ver:* A third-party verifies that appropriate cow care and facilities are provided on farm. | *WW_ver:* A third-party verifies that appropriate human resource management and working conditions are provided on farm. |
| Treatment of Sick | | |
| | *AW_sick:* Sick cows are promptly treated or euthanized. | *WW_sick:* Workers are paid sick time off. |
| Health Plans | | |
| | *AW_health:* A herd health plan is developed with the help of a veterinarian. | *WW_health:* Workers are provided medical insurance. |
| Training | | |
| | *Training:* There is a consistent training program for owners and workers focusing on principles of cow care and handling that increase both animal and worker welfare. | |

These farm practices were not chosen just because of their relationship to animal and worker welfare but also for their individual merits. Prior research has indicated that cow access to outdoor spaces is desirable to consumers (Van Loo et al. 2014; Wolf, et al. 2011) and it is a condition certified by some labeling programs, such as organic and animal welfare approved. As for the worker counterpart, prior research has shown that, "in general, regular rest breaks can be an effective means of maintaining performance, managing fatigue and controlling the accumulation of risk over prolonged task performance" (Tucker 2003 p.123). Despite this, federal law in the U.S. does not require employers to provide employees lunch or coffee breaks (Breaks and Meal Periods n.d.), and less than half of all states have adopted such policies (Minimum Length of Meal Period Required under State Law for Adult Employees in Private Sector 1 2020).

The second group of welfare practices, third party verification is not specific to a law or government action, say as with organic labeling being certified by the USDA, but rather is an option available in the private sector that may help strengthen consumer trust (Wolf and Tonsor 2017). Hence, they may serve as vehicle to boost the demand for food produced under certain welfare practices. To this end, third-party verification is often a component of animal welfare labeling programs, such as Certified Humane, and worker welfare labeling programs, like the Fair Food Program. There are a number of farm practices regulated by certification programs.

Many such animal welfare programs include animal health and sickness provisions. Part of the necessity to include such elements is due to the public's concern about animal health and safety. For example, undercover dairy farm animal welfare videos have generated outcry at the treatment of some sick and lame animals (Wolf and Tonsor 2017). The treatment of sick and health plan farm practices that we have included help address these ongoing concerns[25]. Providing paid sick time off was deemed analogous to promptly treating injured or sick cows as it allows workers a degree of financial security as they proactively treat illness. Finally, as previously alluded to, the joint farm practice was worker training. Consistent training focusing on cow care and handling was deemed to not only enhance the humane treatment of cattle but to increase the safety and efficiency for workers.

[25] The herd health plan was the only animal welfare practice included in this study but not Wolf and Tonsor (2017). It was included in McKendree, et al. (2018). It was chosen here for its similarity to providing health insurance (which explains and reduces the costs of human health maintenance), which has been a topic hotly debated at the national and state levels.

### *3.2.2 Poultry Industry*

Once the animal and worker welfare practices in the dairy industry were determined we sought analogous practices in poultry farm practices, aiding preference comparisons between animal and worker welfare across industries. Since prior studies have found that consumers are willing to pay varied amounts for animal welfare enhancements for different animals (see Clark, et al. (2017) for a meta-analysis of such studies including a discussion of WTP variations across animals) it is possible that they value the relative welfare of animals and workers differently across animals as well. In particular, cage-free systems, which some studies find better for hens, have been found to depress air quality for workers, providing an explicit trade-off between the welfare of animals versus workers (Coalition for Sustainable Egg Supply, n.d.); but, the authors are not aware of such an explicit trade-off in the dairy industry. Do consumers' preferences reveal a recognition of this explicit tradeoff? Which do they value more, animal or worker welfare? To explore these questions in poultry we maintained five of the farm practices from the cow study (pertaining to third-party verification, treatment of the sick and worker breaks) (Table 3.2).

**Table 3.2** Animal and Worker Welfare Practices in the Poultry Industry Included in this Study

| | **Animal Welfare Practice** | **Worker Welfare Practice** |
|---|---|---|
| Meals | | |
| | *AW_meals:* Hens have constant access to food and water | *WW_meals:* Workers are provided paid 15 minute breaks for every 4 hours worked, and a half hour (meal) break between each 4 hour shift. |
| Third-Party Verification | | |
| | *AW_ver:* A third-party verifies that appropriate hen care and facilities are provided on farm | *WW_ver:* A third-party verifies that appropriate human resource management practice and working conditions are provided on farm |
| Treatment of Sick | | |
| | *AW_sick:* Sick animals are promptly treated or euthanized | *WW_sick:* Workers are paid sick time off |
| Cage System | | |
| | *AW_cage:* An aviary or free-range housing system is used which does not constrain hens to individual or small-group cages. | *WW_ cage:* Workers are provided proper respiratory (safety) protection (a N95 mask or respirator) |
| Flock size | | |
| | *Flock_size:* Flock size is not increased without space and staffing capacities within determined ratios, which not only ensures hen space but also restricts the burdens on workers. | |

These five farm practices were deemed the most consistent across both the dairy and poultry industries. For example, the benefit of breaks was reimaged for its more basic benefit of ensuring a meal break for workers. Then access to feed and water was analogous for chicken welfare. Thus, rather than comparing *WW_breaks/WW_meals* to *WW_breaks* (Outdoor Access in Wolf and Tonsor 2017) we focus less on how time is used and more on the purpose and needs driving that break time (Feed and Water in Wolf and Tonsor 2017). Next, we wanted to be certain to include a farm practice pair that would explore the potential tradeoff between improvements for hens and damage for workers via the cage-free system. Note that since all farm practices were phrased as improvements to either animals or workers we did not mention the research and potential negative human effects of the *AW_cage* variable either in its description or as the negative of that practice for worker welfare practice, i.e. Individual battery cages are used

to reduce airborne dust and pathogens for workers. Rather, we chose to frame the worker welfare improving system as respiratory equipment, which would in all likelihood improve worker conditions in any poultry system, but particularly as a way of improving upon a perhaps already adopted cage-free system on behalf of workers. Finally, the joint beneficiary farm practice was replaced from *Training* to *Flock_size*. A consistent flock size to worker ratio theoretically enhances animal wellbeing by ensuring proper care but also prevents the workload from being overwhelming for workers.

### 3.3 Data and Methods

To determine the relative importance the U.S. general population places on the practices in tables 3.1 and 3.2, we utilized a BWS approach as it offers a number of theoretical and practical benefits. For example, by asking not only which object in a set is the most preferred but also which is least preferred, BWS provides additional information on the preference ratings of individuals in an efficient manner, i.e. without requiring having to repeat questions with the remaining objects to ask which is least preferred (Louviere, et al., 2015 p.7). Further, BWS is preferred to other preference elicitation techniques as it requires respondents to make trade-offs between objects and represents a well-understood measure (Finn and Louviere 1990; Lusk and Briggeman 2009; Caputo and Lusk 2020; Wolf and Tonsor 2013). BWS requires tradeoffs as participants cannot choose that all farm practices are important, as with Likert scale questions. Finally, BWS eliminates scale issues in that the terms “most important” and “least important” mean the same across individuals whereas a “4” rating may mean something different, perhaps a “5” rating, to someone else.

For each application (dairy and poultry), an object case (case 1) design was used in which each of the nine farm practices is considered a distinct object. Employment of a balanced incomplete block design generated twelve questions, each with six farm practices (see Figure 3.1 for an example choice question and Table A3.1 in the Appendix for the experimental design). Each practice appeared eight times overall, while pairs of practices appear five times throughout the twelve questions. During the experiment, for each BW question, respondents were asked to select the "most important" and "least important" farm practice within each choice set. The order of the farm practices within each question and the question order were randomized across respondents.

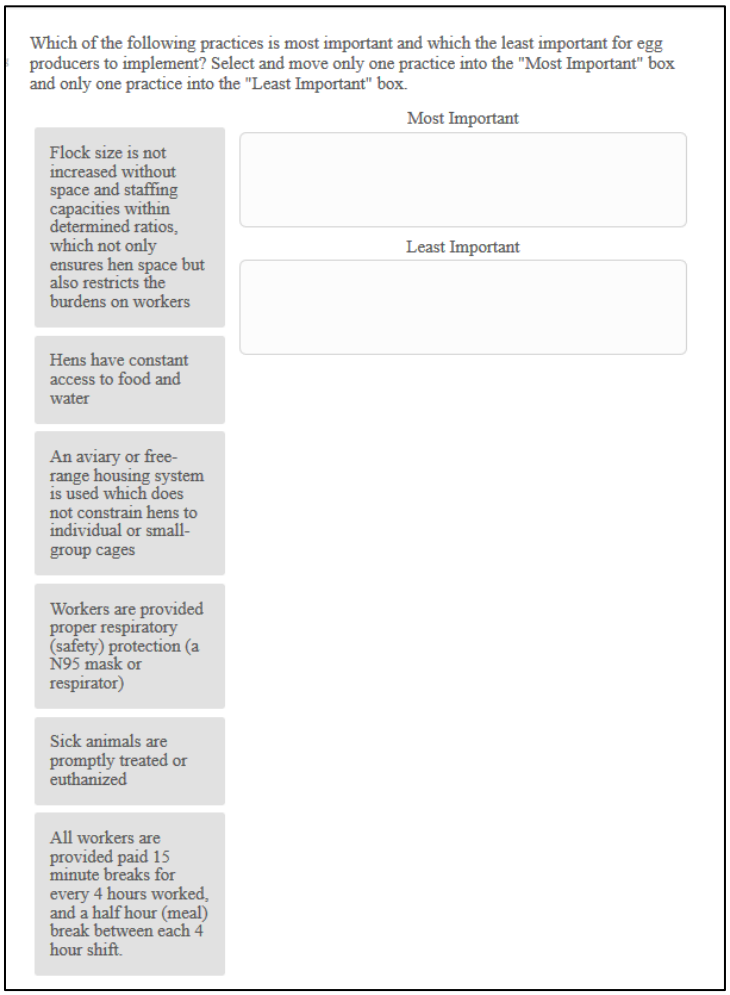


**Figure 3.1** Worker and Animal Welfare Practices in the Poultry Industry BWS Sample Question

The BWS experiment was embedded in a national online survey administered through Qualtrics from January-April, 2019. Adults who had purchased eggs and milk in the last three months were eligible to participate. Participants were randomly assigned to either a milk (dairy) or egg (poultry) survey, with each following the same structure. The survey began with questions about prior shopping behavior for the product. Then respondents completed a discrete choice experiment on animal welfare and worker welfare labeling described in Essay 2 of this dissertation. The next section was the farm practice BWS task. Finally, the survey concluded with demographic questions, including three psychosocial scales.

### *3.3.1 Online Survey*

Summary statistics of the basic demographics and variable definitions are reported in Table 3.3. In total 1,304 people participated with 762 in the dairy experiment and 542 in the poultry experiment.

**Table 3.3** Summary Statistics of Basic Demographics

| Variable | Definition | Dairy Sample | Poultry Sample | Total Sample | U.S. Population |
|---|---|---|---|---|---|
| Gender | 1 if female; 0 otherwise | 0.735 (0.441)[A] | 0.730 (0.445) | 0.733 (0.443) | 0.508[B] |
| Age | | | | | |
| *Young* | 1 if respondent 18-29 years; 0 otherwise | 0.180 (0.384) | 0.190 (0.393) | 0.184 (0.388) | Not available |
| *Mid-age* | 1 if respondent 30-64 years; 0 otherwise | 0.682 (0.466) | 0.673 (0.469) | 0.679 (0.467) | Not available |
| *Senior* | 1 if respondent 65 years or older; 0 otherwise | 0.138 (0.345) | 0.137 (0.344) | 0.137 (0.344) | 0.165[B] |
| Education | | | | | |
| *Low* | 1 if respondent does not have high school degree; 0 otherwise | 0.042 (0.201) | 0.022 (0.147) | 0.034 (0.181) | 0.122[B] |

**Table 3.3 (cont'd)**

| | | | | | |
|---|---|---|---|---|---|
| *Mid* | 1 if respondent has a high school degree but not a bachelor's (4 year) degree; 0 otherwise | 0.634 (0.482) | 0.673 (0.469) | 0.650 (0.477) | 0.563[B] |
| *High* | 1 if respondent has bachelor's (4 year) degree or higher; 0 otherwise | 0.324 (0.468) | 0.304 (0.461) | 0.316 (0.465) | 0.315[B] |
| Income | | | | | |
| *Low* | 1 if respondent has income below $35,000 annually; 0 otherwise | 0.543 (0.498) | 0.557 (0.497) | 0.549 (0.498) | 0.279[C] |
| *Mid* | 1 if respondent has income between $35,000 and $100,000 annually; 0 otherwise | 0.457 (0.498) | 0.443 (0.497) | 0.451 (0.498) | 0.417[C] |
| *High* | 1 if respondent has income above $100,000 annually; 0 otherwise | 0.119 (0.324) | 0.114 (0.319) | 0.117 (0.322) | 0.304[C] |
| U.S. Census Region | | | | | |
| *Northeast* | 1 if resides in Northeast U.S. census region; 0 otherwise | 0.203 (0.402) | 0.199 (0.400) | 0.202 (0.401) | 0.171[D] |
| *Midwest* | 1 if resides in Midwest U.S. census region; 0 otherwise | 0.253 (0.435) | 0.251 (0.434) | 0.252 (0.434) | 0.208[D] |
| *South* | 1 if resides in South U.S. census region; 0 otherwise | 0.391 (0.488) | 0.386 (0.487) | 0.389 (0.488) | 0.382[D] |
| *West* | 1 if resides in West U.S. census region; 0 otherwise | 0.152 (0.359) | 0.164 (0.371) | 0.157 (0.364) | 0.239[D] |
| Political Party | | | | | |
| *Democrat* | 1 if respondent Democrat; 0 otherwise | 0.356 (0.479) | 0.351 (0.478) | 0.354 (0.478) | 0.33[E] |
| *Republican* | 1 if respondent Republican; 0 otherwise | 0.291 (0.455) | 0.282 (0.451) | 0.288 (0.452) | 0.26[E] |
| In-group Identification | Ranges from 1 (low national (American) in-group identification) to 5 (high in-group id) | 3.803 (0.746)[A] | 3.730 (0.807) | 3.773 (0.773) | N/A |
| Illegal Aliens Scale | -1 if think negatively of illegal aliens; 1 if think positively of illegal aliens; 0 if neutral | -0.278 (0.919) | -0.240 (0.933) | -0.262 (0.925) | N/A |

[A] Numbers in parentheses are standard deviations [B] Data from U.S. Census Bureau (n.d) [C] Data from Semega, et al. (2019) [D] Data from National Population Totals and Components of Change: 2010-2019 (2019) [E] Data from Wide Gender Gap, Growing Educational Divide in Voters' Party Identification (2018)

There were more women who participated than men, which is a common occurrence in online research studies of primary shoppers (Grebitus et al., 2013; Lusk, 2011; Nocella et al., 2010). As this study was issued at the same time as a food discrete choice experiment, the target audience was household's primary grocery shoppers who also tend to be skewed female. Most respondents were between 30 and 64 years of age. We fail to reject the hypotheses that the mean of seniors is different from that in the overall U.S. population (U.S. Census Bureau n.d.). Approximately one third of the sample had at least a bachelor's degree which is similar to the percentage in the U.S. population (U.S. Census Bureau n.d.). Our sample income was below national levels as only 27.9% of households had income below $35,000 and 30.4% had income over $100,000 in 2018 (Semega, et al. 2019). In the dairy sample the Northeast and Midwest were over-represented relative to the West; in the poultry sample the Midwest was over-represented relative to the West. In 2018, 33% and 26% of registered voters identified as Democrats and Republicans respectively (Wide Gender Gap, Growing Educational Divide in Voters' Party Identification 2018). These are approximately the same representation in our sample, except that our dairy sample has more Republicans represented.

In addition to these basic demographics, respondents indicated their opinion with various statements that allowed for the calculation of three psychosocial scales: in-group identification, illegal aliens scale, and an animal welfare-worker welfare scale.

The in-group identification scale was constructed from the nine questions used in Lyons, et al. (2013) which included questions like "Being an American is central to my sense of who I am". The final scale variable was continuous and ranged from one, low American in-group identification, to five, strong national in-group identification. Our sample tended to have a strong national, American in-group identification. Potentially, since many farmhands are immigrants,

sense of national in-group identification, American nationalism, would be related to one's concern about farm worker welfare. More specifically, we anticipated that the higher the in-group identification score the less concerned the individual would be with worker welfare farm practices.

The illegal aliens scale was constructed from the twenty questions used in Ommundsen, et al. (2002) which included questions like "All illegal aliens deserve the same rights as United States citizens." The original scale variable was continuous ranging from -10 to 10. We further reduced the scale to a three-level categorical variable where -1 meant overall respondent looks negatively on illegal aliens, 0 meant the respondent was neutral toward illegal aliens, and 1 meant overall the respondent looks favorably toward illegal aliens. On average, our sample respondent was more negative toward illegal aliens. Similar to the in-group identification scale, we hypothesized that respondents may conflate immigrant farm workers with illegal aliens and thus those with a low illegal aliens score would be less concerned with worker welfare farm practices.

### *3.3.2 Econometric Model*

A key feature of BWS is that it is consistent with random utility theory (RUT). [26] RUT assumes that people choose the item that provides the greatest utility. According to the RUT, the probability that the respondent *n* selects item *j* (as best) and *k* (as worst) out of *J* items in BWS question *t* is the probability that the difference in utility of the selected items ($U_{njt}$ and $U_{nkt}$) is greater than all other $J(J-1)-1$ possible differences within each BWS question (Lusk &

[26] It is also consistent with fixed utility or constant utility theory but such theories are more applicable to psychology than economics and will be ignored here, as differences are miniscule between both theories in this application (Louviere, Flynn, and Marley 2015 p.12).

Briggeman, 2009; Caputo and Lusk 2020). Utility is comprised of two components, the difference in utility between the *j* best and the *k* worst practices ($\beta_{jt} - \beta_{kt}$) and a random error term ($\varepsilon_{njt}$):

$$U_{njt} = (\beta_{jt} - \beta_{kt}) + \varepsilon_{njt} \quad (1)$$

where $\beta$ is the vector of estimated parameters of the *j* best and *k* worst practices relative to a baseline practice. In this application, we selected nine farm practices (described in tables 3.1 and 3.2) and respondents were asked to respond to twelve questions (*T* = total number of best-worst questions = 12). Each choice question was represented by six-items or farm practices, and *WW_sick* was chosen as the baseline as it had the lowest best-worst choice frequency. As there are $J = 6$ policies in each choice question, respondents choose between $J(J-1) = 30$ most important- least important farm practice pairs, meaning that utility difference from chosen pair *j-k* is larger than the utility difference from $J(J-1) - 1 = 29$ other best-worst pairs.

The resulting model can be estimated using models that either assume preference homogeneity or allows preferences to vary across respondents. We use a latent class analysis (LCA) as recent studies have found preferences for animal welfare practices to differ within a population when utilizing BWS (McKendree, et al. 2018). LCA models allow to identify the mean importance parameters shared by groups of individuals but which differ across groups. If political change is driven by the collective action of factions as argued by James Madison (1787) in *Federalist No. 10,* then latent class analysis is helpful in identifying the bonding characteristics of groups with similar policy wants. Additionally, group size can be estimated such that the relative strength of any preference group can be identified. This is constructed based on the individual probabilities of a respondent being in a specific class given their preferences.

Formally, the unconditional probability of a best-worst pair being selected given the latent class *s* respondent *n* belongs to can be represented as follows:

$$P_{nj|s} = \sum_s \pi_s \prod_{t=1}^{T} \frac{e^{\left[\beta_{jt|s} - \beta_{kt|s}\right]}}{\sum_{l=1}^{J}\sum_{m=1}^{J} e^{\left[\beta_{lt|s} - \beta_{mt|s}\right] - J}} \quad (2)$$

Based on equation (2), parameters in the observed portion of the utility can be estimated by maximizing the log-likelihood function. The estimated parameters from equation (2) are not readily interpretable. Thus, we calculate the share of preferences for each farm practice, $\Upsilon_j$. The forecasted probability that a farm practice is picked as most important is equal to

$$\Upsilon_j = \frac{e^{\widehat{\beta_j}}}{\sum_{k=1}^{J} e^{\widehat{\beta_l}}} \quad (3)$$

As probabilities, the preference shares for all nine policies are positive and sum to 1 allowing for meaningful interpretation. As the preference share is computed with a ratio scale, if the share of preferences is twice as large for one farm practice as for another, then that farm practice is twice as preferred. This also means that if all farm practices were equally valued that we would expect them to each have preference share of 1/9=0.111. Thus, if a practice's preference share is below 0.111, we can say that the policy is generally deemed less important than the other practices with shares above 0.111. In each application (dairy and poultry), following Caputo and Lusk (2020) and McKendree et al (2018) the preference shares of each practice were computed by using the Krinsky & Robb (1986) bootstrapping method employing 1,000 draws from multivariate normal distributions, which also allows for the construction of confidence intervals.

Additionally, class membership probabilities can be estimated for each individual from the LCM. Participants can then be sorted into the classes identified in the LCM based on whether their

likelihood of being in a particular class was greater than 0.50.[27] Then demographic and psychosocial characteristics across classes were compared using *t*-tests.

### 3.4 Results

In this section we report the estimates from the LCMs utilized to estimate the data from both the dairy and poultry applications. In each application, the optimal number of classes in the LC models was selected in accordance with the usual information criteria for non-nested models such as the Akaike Information Criteria (AIC), modified Akaike Information Criteria (3AIC), and the Bayesian Information Criteria (BIC). Additionally, attention was paid to the cluster size to ensure each group represented a sizeable portion of the population. As can be shown in Table 3.4 the criteria continue to decrease across the four-model specification. However, beginning in the four-class model, classes with less than 10% of the population result. Therefore, based on these criteria we selected the models considering four classes for both the dairy and poultry applications, the results of each are presented in the following respective subsections.

[27] This cut-off allowed us to categorize all but six participants in a single class who were subsequently dropped from analysis.

**Table 3.4** Latent Class Model Comparisons

| *Dairy Application* | | | | |
|---|---|---|---|---|
| Number of Latent Classes | 2 | 3 | 4 | 5 |
| Size of Class 1 | 0.326*** (0.021) | 0.169*** (0.017) | 0.063*** (0.010) | 0.054*** (0.009) |
| Size of Class 2 | 0.674*** (0.021) | 0.256*** (0.018) | 0.123*** (0.015) | 0.107*** (0.013) |
| Size of Class 3 | | 0.576*** (0.022) | 0.228*** (0.017) | 0.109*** (0.013) |
| Size of Class 4 | | | 0.586*** (0.020) | 0.224*** (0.017) |
| Size of Class 5 | | | | 0.505*** (0.021) |
| LLF | -29213.929 | -28749.827 | -28475.023 | -28032.319 |
| AIC | 58461.858 | 57551.654 | 57020.046 | 56152.638 |
| 3AIC | 58478.858 | 57577.654 | 57055.046 | 56196.638 |
| BIC | 58433.524 | 57506.170 | 56957.157 | 56072.206 |
| *Poultry Application* | | | | |
| Number of Latent Classes | 2 | 3 | 4 | 5 |
| Size of Class 1 | 0.346*** (0.023) | 0.218*** (0.025) | 0.095*** (0.018) | 0.081*** (0.015) |
| Size of Class 2 | .654*** (0.023) | 0.305*** (0.021) | 0.110*** (0.016) | 0.092*** (0.016) |
| Size of Class 3 | | 0.477*** (0.029) | 0.315*** (0.023) | 0.121*** (0.018) |
| Size of Class 4 | | | 0.480*** (0.025) | 0.257*** (0.022) |
| Size of Class 5 | | | | 0.448*** (0.025) |
| LLF | -20227.557 | -19881.523 | -19659.975 | -19490.078 |
| AIC | 40489.114 | 39815.046 | 39389.950 | 39068.156 |
| 3AIC | 40506.114 | 39841.046 | 39424.950 | 39112.156 |
| BIC | 40460.780 | 39769.562 | 39327.061 | 38987.724 |

*3.4.1 Results of the Dairy Application*

Table 3.5 reports the shares of preferences of the nine practices calculated using the coefficients from the LCM (see Table A3.2 in the Appendix) and employing the Krinsky and Robb method as described in the methods section. Before describing the preferences of each class individually we examine the commonalities across classes. Training is deemed the most important farm practice across the two largest classes (14% in Class 1 and 27% in Class 2). Additionally, while not the highest ranked farm practice for members of the third largest class, training was reflected as important 15% of times over the least important practice (worker sick policies). It also never ranks below the fifth (mid-point) most important practice for Classes 3 and 4. Therefore, training, which benefits both animals and workers, is the preferred farm practice among the U.S. public of those investigated. Promptly treating or euthanizing sick animals tends to also be a farm practice that is ranked as highly important receiving 14%, 21%, 25%, and 5% importance shares in Classes 1-4 respectively. In terms of rank order, treatment of sick animals is ranked once as most important, twice as second most important, and once as fourth most important. With one exception it is always ranked higher than its worker welfare counterpart practice. Interestingly, although common in white-collar jobs, worker paid sick leave is ranked in the bottom three most important farm practices for the three largest classes, suggesting that implementing this farm practice is not a priority to the majority of the public. While it is helpful to know the preferences of the U.S. public as a whole, it is also informative to explore preferences across groups.

**Table 3.5** Latent Class Modeling Shares for U.S. Public's View on the Importance of Selected Production Practices in the Dairy Industry

| | Class 1: Values practices equally | Class 2: Animal welfare oriented | Class 3: Concerned with treatment of sick animals | Class 4: Concerned with worker health |
|---|---|---|---|---|
| % of Sample in Class | 58.6% | 22.8% | 12.3% | 6.3% |
| Production Practice | | | | |
| *AW_Breaks* | 0.087 [0.072, 0.105] | 0.146 [0.131, 0.165] | 0.185 [0.140, 0.233] | 0.028 [0.026, 0.030] [A] |
| *WW_Breaks* | 0.089 [0.073, 0.107] | 0.017 [0.014, 0,019] | 0.052 [0.038, 0.069] | 0.140 [0.132, 0.149] |
| *AW_Ver* | 0.104 [0.085, 0.126] | 0.132 [0.117, 0.150] | 0.015 [0.011, 0.019] | 0.016 [0.015, 0.017] |
| *WW_Ver* | 0.108 [0.089, 0.128] | 0.087 [0.076, 0.100] | 0.185 [0.138, 0.243] | 0.026 [0.025, 0.028] |
| *AW_Sick* | 0.135 [0.113, 0.160] | 0.210 [0.190, 0.231] | 0.245 [0.185, 0.317] | 0.051 [0.048, 0.055] |
| *WW_Sick* | 0.098 [0.080, 0.118] | 0.008 [0.007, 0.010] | 0.045 [0.032, 0.060] | 0.152 [0.143, 0.161] |
| *AW_Health* | 0.114 [0.096, 0.135] | 0.108 [0.093, 0.123] | 0.035 [0.026, 0.046] | 0.014 [0.013, 0.015] |
| *WW_Health* | 0.125 [0.098, 0.155] | 0.019 [0.016, 0.022] | 0.088 [0.062, 0.120] | 0.541 [0.525, 0.557] |
| *Training* | 0.140 [0.117, 0.165] | 0.272 [0.251, 0.295] | 0.151 [0.110, 0.196] | 0.030 [0.028, 0.032] |

[A] 95% Confidence intervals derived following Krinsky and Robb (1986) are reported in brackets.

Class 1 is the largest class. It contains the majority of the population, comprising over 50% of respondents. Given that Class 1 ranks all practices evenly, this group potentially poses a challenge to producers depending on their level of political activism, which is open for further research. Many of the confidence intervals include 0.11 which would be the equal preference share value. On the other hand, it is also possible that this group has no clear farm practice prioritization because this is not an issue to which they devote considerable attention. If this is the case then producers may feel relieved that the majority of the public does not deem

interfering in or overseeing farm practices as important. These two divergent outcomes reiterate the need for further research into the behaviors of Class 1.

Class 2 was the second largest membership group, with an associated class membership probability of 22.8%. Members of this group had perhaps the most intuitive preference rankings to interpret. To illustrate, the training policy, which was presented as the only practice to improve both animal and worker welfare, has the highest share of preference, with 27% of respondents on average considering training to be the most important policy. The next most important farm practices to Class 2 members were the animal welfare sick and break practices, which received 21% and 15% share of respondents respectively. Interestingly, the worker welfare companions of these practices (*WW_sick* and *WW_break* ) were the least and second least important practices, respectively. For example, worker sick has the lowest preference share of all farm practices across all classes; less than 1% of respondents would rank it as most important.. Further, while worker sick leave was distinctly deemed least important, all stand-alone worker welfare practices were ranked lower than their corresponding animal welfare practices; 15%, 13%, 21%,and 11% for animals' and 2%, 9%, 1%, and 2% for workers' breaks, verification, sick practices, and health practices……, respectively. Therefore, Class 2 individuals can be characterized as prioritizing animal welfare above worker welfare farm practices. Therefore, we named this class "Animal welfare oriented".

There is a less obvious logic to the preference rankings of Class 3, which has an associated class membership probability of 12.3%. On one hand an animal welfare practice, *AW_sick*, ranks as the most important practice (25%). On the other hand, a different animal welfare practice, *AW_Ver*, ranks as the least important farm practice (2%). Furthermore, a worker welfare practice, *WW_Ver*, is tied to the second most important practice (19%). Thus,

unlike Class 2, we cannot conclude that Class 3 members strongly prefer either worker or animal welfare. We also cannot say that this group ranks practices based on the welfare pair category. For example, while verification of animal welfare conditions, *AW_ver*, is the least important practice to this group (2%), the analogous verification of worker welfare conditions, *WW_ver*, is tied for the second most important practice (19%). We refer to this class as the "Concerned with treatment of sick animals" group.

Class 4 has the lowest associated class membership probability; 6.3%. The most important farm practices to Class 4 are associated with the worker welfare practices. For example, *WW_health*, with a preference share of 54%, was ranked as the most important farm practice– the largest share for any practice across all classes *WW_sick* and *WW_breaks* follow, with a share of preferences of 14% and 15.2% respectively. The lowest ranked worker welfare practice is worker verification as the third least important practice (*WW_ver* 3%); however, this rank is still higher than the corresponding animal welfare verification practice (*AW_ver* 2%), suggesting that verification of farm practices is not a strong priority to this group compared to the implementation of such practices. Therefore, we refer to this class as the "Concerned with worker health" group.

Since there are distinct preference structures across groups, we might ask if these groups are identifiable by various demographics. That is, if we cannot easily observe these farm practice preferences, which unless an advocate or politically active it is difficult to do, can we identify members of these classes by other characteristics? The demographics of each class are summarized in Table A3.3 of the Appendix. Young individuals (under 30) are most likely to be a member of Class 1. While not statistically different from other classes, class 1 members tend to be skewed toward lower to mid-range (less than $100,000) incomes. Respondents who are in

Group 4 of the animal welfare-worker welfare scale are also generally more likely to be in Class 1 than the other classes. Class 2 has the largest percent representation of females in the study. It does not include many individuals from the Northeast compared to the other classes. Republicans are most likely to be in Class 2. Class 3 has fewer distinguishing characteristics, often falling within the range of other class demographics. Class 4 is most likely to be comprised of middle-age (from 30-65 years old) low-income (less than $35,000) individuals. Class 4 also has the greatest share of Democrats.

### *3.4.2 Results of the Poultry Application*

The preference shares are reported in Table 3.6 and were calculated from the coefficients reported in Table A3.4 of the Appendix and using equation (3). Before exploring the preferences of each class in the poultry experiment, it is worth discussing two observations comparing rankings across groups. The first is that the animal sick practice and animal meals practice are deemed the most and second most important farm practices for the three largest classes, respectively. Prompt treatment of sick animals receives 16%, 27%, and 37% of respondents from each respective class. Constant access to food and water for hens receives 16%, 22%, and 24% of respondents from each respective class. It is clear from these results that in the poultry industry attending to animal health quickly and ensuring constant access to food and water should be the priority.[28] Also consistent across classes is the ranking of the flock size practice ensuring a maximum ratio of chickens to workers. *Flocksize* was ranked as the fourth or fifth

[28] It is worth stressing here that we make no claims about the proportion of the industry producers already implementing this practice and therefore whether there is need for change. Our results provide commentary on the farm practices currently implemented and that could be implemented in the poultry industry.

most important practice, towards the upper middle of rankings, for all groups. Thus, implementing this farm practice is not necessarily a priority but is also potentially less likely to cause debate and frustrations among the general U.S. public. Despite this similar ranking across classes, our analyses indicate that preferences are indeed heterogeneous across groups, warranting an exploration of the preferences of each cohort individually.

**Table 3.6** Latent Class Modeling Shares for U.S. Public's View on the Importance of Selected Production Practices in the Poultry Industry

| | Class 1: Verification of low importance | Class 2: Animal welfare oriented | Class 3: Concerned with animal health and sickness | Class 4: Verification of high importance |
|---|---|---|---|---|
| % of Sample in Class | 48.0% | 31.5% | 11.0% | 9.5% |
| Production Practice | | | | |
| *AW_Meals* | 0.159 | 0.216 | 0.242 | 0.045 |
| | [0.147, 0.170] | [0.192, 0.242] | [0.200, 0.287] | [0.034, 0.058] [A] |
| *WW_Meals* | 0.108 | 0.016 | 0.040 | 0.148 |
| | [0.100, 0.116] | [0.014, 0.019] | [0.027, 0.057] | [0.115, 0.185] |
| *AW_Ver* | 0.084 | 0.089 | 0.009 | 0.136 |
| | [0.077, 0.092] | [0.078, 0.102] | [0.006, 0.012] | [0.112, 0.163] |
| *WW_Ver* | 0.087 | 0.049 | 0.008 | 0.278 |
| | [0.080, 0,095] | [0.042, 0.057] | [0.006, 0.011] | [0.221, 0.338] |
| *AW_Sick* | 0.160 | 0.269 | 0.373 | 0.057 |
| | [0.148, 0.172] | [0.246, 0.292] | [0.316, 0.432] | [0.039, 0.078] |
| *WW_Sick* | 0.116 | 0.008 | 0.030 | 0.023 |
| | [0.106, 0.126] | [0.007, 0.010] | [0.020, 0.043] | [0.016, 0.032] |
| *AW_Cage* | 0.073 | 0.175 | 0.069 | 0.059 |
| | [0.067, 0.079] | [0.155, 0.196] | [0.053, 0.088] | [0.033, 0.095] |
| *WW_Cage* | 0.137 | 0.060 | 0.160 | 0.124 |
| | [0.127, 0.147] | [0.052, 0.071] | [0.126, 0.200] | [0.102, 0.148] |
| *Flocksize* | 0.117 | 0.117 | 0.068 | 0.130 |
| | [0.105, 0.130] | [0.105, 0.130] | [0.052, 0.085] | [0.104, 0.157] |

[A] 95% Confidence intervals derived following Krinsky and Robb (1986) are reported in brackets.

For Class 1 (48% of the population) the preferred beneficiary of the welfare practice is split. The two most important practices to this group are for the benefit of hens (*AW_sick* and *AW_meals* with 16% of respondents each with the share of preferences of %) while the two least important practices are also for animals (*AW_cage* and *AW_ver* with 7% and 8% of respondents respectivelyX with the share of preferences of %). Respondents in this class rank verification schemes low in importance, with preference shares around 8%. Otherwise there seems to be no obvious logic as to why class 1 poultry has the following farm practice ranking from most important to least important: *AW_sick* (16%), *AW_meals* (16%), *WW_cage* (14%), *Flocksize* (12%), *WW_sick* (12%), *WW_meals* (11%), *WW_ver* (9%), *AW_ver* (8%), *AW_cage* (7%).[29]We refer to this class as *"*Verification of low importance" group.

Class 2 (33% of the population) can be described as preferring animal welfare practices to worker welfare practices. In fact, as can be seen, the animal sick and animal meals practices were the most (27%) and second (22%) most important farm practices to Class 2 individuals, followed by *AW_cage* (18%). In contrast the worker-oriented sick and meal farm practices received the ranking of least and second least important farm practices among Class 2 individuals, collectively comprising less than 3% of the preference shares. Therefore, we refer to this class as *"*Animal Welfare Oriented" group.

[29] It is possible the reader would disagree with this statement and consider class 1 uninformed and concerned about animal welfare and Class 2 as informed and concerned about animal welfare. While we have posited that cage free systems are good for hens, this orientation was chosen mostly for the perceived consumer belief about the system (Lusk 2019; Lusk 2010). As mentioned in footnote 14 there is also existing research indicating that cage-free systems are worse for hens. If someone believe this line of research and knew that many animal welfare verification labels require this system, then they would actually be against both the cage-free system and such programs that require it when prioritizing hen health. We have made a judgement call that this is not the primary driver of preference rankings for this group but it is not based on evidence. Future research into Class 2 poultry preferences is needed.

Class 3 (11% of the population) devotes significant attention to their perceived most important practices related to animal illness and access to food and water (37% and 24% share of preferences, respectively).Practices related to the health benefits of people in the cage-free system (*WW_cage,* 16%) are also highly important. On the other hand, respondents in this class would, on average, devote less than one percent of preference shares to each verification practice (1% for both *AW_ver* and *WW_ver*). We refer to this class as "Concerned with animal health and sickness" groups.

Class 4 (10% of the population) deviates strongly from the other groups in that the top two most important practices for other groups are in the bottom three most important farm practice for Class 4. Instead, Class 4 values verification practices as most important; worker verification grasps a 28% preference shares and animal welfare verification a 14% preference share. This is particularly interesting as there are few such verification programs that currently exist related to worker welfare. Also important to this group is worker time for meal and snack breaks. Of all the classes, Class 4 ranks worker welfare practices most favorably with a 15% preference share.

As class 4 was the only class to rank verification practices so highly, a natural question is if these respondents live in areas where such verification systems already exist. For worker welfare this is largely limited to the South. As can be seen in Table A3.5 in the Appendix, the most people from the South can be found in Class 4, however, Class 4's Southern representation is not statistically different from the other classes. Class 4 contains the most individuals with at least a bachelor's degree. Class 3 has a greater proportion of females than the other classes. Class 2 has a greater representation of middle-aged individuals and a smaller proportion of Democrats.

Finally, Class 1 is younger with a more positive illegal aliens score indicating individuals in that class look more favorably on illegal aliens.

### 3.5 Discussion

As previously mentioned, these experiments were inspired in part by Wolf and Tonsor (2017). Therefore, we begin our discussion of results by comparing the results from the dairy application to Wolf and Tonsor's (2017) results. Wolf and Tonsor (2017, Table 3 p.168) use three measures to elicit rankings of farm practices amongst consumers. There are many differences between what consumers say the most effective and practical production practices are and the practices they are willing to pay the most for. Training was ranked the most effective of the practices replicated in this study but only ranked third in terms of practicality and willingness-to-pay (WTP). Our findings were that the majority ranked training as the most important farm practice, perhaps suggesting that consumers evaluate importance based on effectiveness. However, this interpretation is contradicted when we look at *AW_Sick. AW_Sick* was ranked as most or second most important among three of the classes. It was ranked as most practical and had the second highest WTP estimate in Wolf and Tonsor (2017). However, of the four farm practices used in both dairy studies, promptly treating or euthanizing sick animals was deemed the least effective practice. Perhaps most interesting is that consumers were willing to pay the greatest amount for third party verification among the four farm practices. Yet in our study, third party verification is deemed comparatively unimportant, which is more similar to its rank in effectiveness and practicality questions. Thus, as in other studies, these results leave us to wonder if people actually act on the beliefs that they state are most important to them.

While there are still certainly areas for further research, part of the value of exploring preferences for farm practices in the dairy and poultry industries is to see how preference ranking compare across industries. Before proceeding with this comparison, recall that respondents only completed one experiment. Therefore, the individuals in the dairy experiment are not the same as those providing their rankings in the poultry experiment. Also, Class 1 in the dairy application is not comprised of the same type of individuals as Class 1 in the poultry experiment. Keeping this information in mind, what can be learned by comparing the two experiments? First, the practice benefiting both animals and workers is never ranked lower than fifth in most important. For the dairy industry the training practice is deemed the most important practice by the majority, while the flock size to worker ratio is a middle-of-the-pack practice. Consistently near the top of the most important list of farm practices across industries is promptly treating or euthanizing sick animals. This might be because respondents envision a halo effect, that healthy animals leads to safer or better tasting consumption goods. On the other hand, worker paid sick time off is typically not deemed an important farm practice. This might be because paid sick time off is unusual in hourly wage-based positions. Nevertheless, among public debate about access to medical care and concerns about community health, it is interesting that the public does not prioritize providing individuals time to recover from illness without financial distress.

### 3.6 Conclusion

The U.S. public is placing increasing pressure on animal food product producers to treat their animals as the public deems most acceptable. Recently, there have also been discussions about some workers' desire for better work environments, which has led to questions about human rights on farms. Understanding which farm practices consumers deem acceptable or

unacceptable is important to producers who wish to maintain demand for their products and maintain their social license to produce. Additionally, insight into public opinion can assist policymakers in determining when to intervene in business affairs based on notions of social acceptability. Furthermore, in an environment where voters often demand many changes, some of which may be contradictory, it is helpful for policymakers to know which issues are of most importance to constituents. Additionally, there may be different groups of constituents with varied preferences. Understanding the preferences of these groups and the respective size of each group could also be beneficial to policymakers.

In this study, we employ two best worst scaling experiments, one each for hens and cows, to elicit the public's perceptions regarding animal welfare and worker welfare farm practices. Within the national sample there were found to be four clusters of respondents within each industry. The second largest cluster in both the dairy and poultry industry experiments valued animal welfare practices over worker welfare practices. The three remaining clusters in the dairy experiment included a group whose preferences were difficult to explain, a small group who placed high importance to worker health plans, and the majority who viewed all farm practices as approximately equally important.

In the aggregate, training and promptly treating sick animals were deemed as the most important farm practices in the dairy study. By comparison, in the poultry industry treatment of sick animals and animal access to food and water were pivotal to most individuals. These practices may be highly ranked because of a halo effect in which consumers perceive the safety or the quality of the food product to increase with implementation of prompt hen treatment and reliable access to nutrients. Also notable, maintaining a specific ratio of hens to workers was also a palatable but neither highly important nor highly unimportant practice to implement.

Observations related to Class 1 of the dairy experiment and Class 1 of the poultry experiment suggest, small segments of the population may be driving the call for labeling programs and health insurance for workers. The former is consistent with prior studies which have indicated that small shares of the population are willing to pay a price premium great enough to cover implementation costs of such systems.

Our findings should be considered by agribusinesses and marketers, particularly amidst the growing proliferation of labeling programs, and their corresponding verification systems, in food markets. There are a number of interesting questions resulting from this novel exploration into attitudes surrounding worker welfare in agricultural sectors. Future research could focus on whether the public acts on these preferences politically and estimate any increased costs for implementation on farm.

# APPENDIX

# APPENDIX

**Table A3.1** Experimental Design

| Question Number | Farm Practices [A] | | | | | |
|---|---|---|---|---|---|---|
| 1 | 9[B] | 1 | 7 | 8 | 5 | 2 |
| 2 | 4 | 5 | 2 | 1 | 6 | 9 |
| 3 | 4 | 8 | 2 | 6 | 1 | 7 |
| 4 | 2 | 1 | 3 | 6 | 9 | 7 |
| 5 | 8 | 2 | 3 | 5 | 4 | 1 |
| 6 | 4 | 5 | 7 | 2 | 9 | 3 |
| 7 | 1 | 4 | 8 | 9 | 3 | 7 |
| 8 | 5 | 7 | 6 | 3 | 8 | 2 |
| 9 | 5 | 9 | 8 | 7 | 4 | 6 |
| 10 | 9 | 1 | 5 | 8 | 3 | 6 |
| 11 | 1 | 4 | 7 | 5 | 6 | 3 |
| 12 | 4 | 9 | 3 | 2 | 8 | 6 |

[A] Farm practice order within each question and question order were randomized across respondents [B] Farm practices in Tables 3.1 and 3.2 were numbered from 1 to 9 from the top right cell to the right and down.

**Table A3.2** Summary Statistics of Basic Demographics *t*-Tests of Differences in Sample Average across Dairy Latent Classes

| Variable | Class 1: Mid-age, low-income, Democrats | Class 2: Non-distinct | Class 3: Female, non-Northeasterner Republicans | Class 4: Young, low to middle income, AW-WW scale group 4 |
|---|---|---|---|---|
| Gender | 0.651 | 0.762 | 0.798 | 0.714 |
| Age | | | | |
| *Young* | 0.023 | 0.179 | 0.129 | 0.215 |
| *Mid-age* | 0.814 | 0.595 | 0.669 | 0.690 |
| *Senior* | 0.163 | 0.226 | 0.202 | 0.095 |
| Education | | | | |
| *Low* | 0.070 | 0.024 | 0.028 | 0.048 |
| *Mid* | 0.465 | 0.571 | 0.657 | 0.653 |
| *High* | 0.465 | 0.405 | 0.315 | 0.299 |
| Income | | | | |
| *Low* | 0.767 | 0.690 | 0.567 | 0.484 |
| *Mid* | 0.233 | 0.310 | 0.433 | 0.516 |
| *High* | 0.163 | 0.131 | 0.112 | 0.116 |
| U.S. Census Region | | | | |
| *Northeast* | 0.279 | 0.250 | 0.152 | 0.209 |
| *Midwest* | 0.209 | 0.226 | 0.270 | 0.257 |
| *South* | 0.349 | 0.369 | 0.433 | 0.382 |
| *West* | 0.163 | 0.154 | 0.146 | 0.151 |
| Political Party | | | | |
| *Democrat* | 0.465 | 0.310 | 0.281 | 0.385 |
| *Republican* | 0.186 | 0.310 | 0.340 | 0.273 |
| In-group Identification | 3.897 | 3.858 | 3.881 | 3.757 |
| Illegal Aliens Scale | -0.116 | -0.357 | -0.478 | -0.204 |

**Table A3.2 (cont'd)**

| | t-Test for Differences across Classes (yes = significant at 0.10 level) | | | | | |
|---|---|---|---|---|---|---|
| Variable | 1 & 2 | 1 & 3 | 1 & 4 | 2 & 3 | 2 & 4 | 3 & 4 |
| Gender | No | Yes | No | No | No | Yes |
| Age | | | | | | |
| *Young* | Yes | Yes | Yes | No | No | Yes |
| *Mid-age* | Yes | Yes | Yes | No | No | No |
| *Senior* | No | No | No | No | Yes | Yes |
| Education | | | | | | |
| *Low* | No | No | No | No | No | No |
| *Mid* | No | Yes | Yes | No | No | No |
| *High* | No | Yes | Yes | No | Yes | No |
| Income | | | | | | |
| *Low* | No | Yes | Yes | Yes | Yes | Yes |
| *Mid* | No | Yes | Yes | Yes | Yes | Yes |
| *High* | No | No | No | No | No | No |
| U.S. Census Region | | | | | | |
| *Northeast* | No | Yes | No | Yes | No | Yes |
| *Midwest* | No | No | No | No | No | No |
| *South* | No | No | No | No | No | No |
| *West* | No | No | No | No | No | No |
| Political Party | | | | | | |
| *Democrat* | Yes | Yes | No | No | No | Yes |
| *Republican* | No | Yes | No | No | No | Yes |
| In-group Identification | No | No | No | No | No | Yes |
| Illegal Aliens Scale | No | Yes | No | No | No | Yes |

**Table A3.3** Latent Class Model Coefficient Estimates for U.S. Public's View on the Importance of Selected Production Practices in the Dairy Industry

| | Class 1: Mid-age, low-income, Democrats | Class 2: Non-distinct | Class 3: Female, non-Northeasterner Republicans | Class 4: Young, low to middle income, AW-WW scale group 4 |
|---|---|---|---|---|
| Production Practice | | | | |
| *AW_Breaks* | -1.698*** (0.187) [A] | 1.428*** (0.150) | 2.869*** (0.119) | -0.110** (0.044) |
| *WW_Breaks* | -0.080 (0.155) | 0.147 (0.145) | 0.694*** (0.081) | -0.089** (0.041) |
| *AW_Ver* | -2.230*** (0.201) | -1.117*** (0.138) | 2.765*** (0.122) | 0.071 (0.045) |
| *WW_Ver* | -1.757*** (0.197) | -1.431*** (0.152) | 2.347*** (0.110) | 0.095** (0.045) |
| *AW_Sick* | -1.085*** (0.194) | 1.700*** (0.151) | 3.228*** (0.116) | 0.320*** (0.044) |
| *WW_Sick* | Baseline Farm Practice (0.00) | | | |
| *AW_Health* | -2.393*** (0.215) | -0.238* (0.137) | 2.566*** (0.113) | 0.154*** (0.045) |
| *WW_Health* | 1.269*** (0.178) | 0.678*** (0.131) | 0.811*** (0.074) | 0.241*** (0.042) |
| *Training* | -1.615*** (0.213) | 1.220*** (0.140) | 3.487*** (0.122) | 0.360*** (0.046) |
| Membership Percent | 6.3%*** | 12.3%*** | 22.8%*** | 58.6%*** |
| Log Likelihood | -28475.023 | | | |
| Akaike Information Criterion | 57020.046 | | | |
| Bayesian Information Criterion | 56957.157 | | | |

[A] Standard errors are in parentheses. Asterisks (***, **, *) indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

**Table A3.4** Summary Statistics of Basic Demographics *t*-Tests of Differences in Sample Average across Poultry Latent Classes

| | Average | | | |
|---|---|---|---|---|
| Variable | Class 1: Highly educated | Class 2: Female | Class 3: Mid-age, non-Democrats | Class 4: Young and more pro I.A. |
| Gender | 0.816 | 0.845 | 0.747 | 0.674 |
| Age | | | | |
| *Young* | 0.081 | 0.119 | 0.118 | 0.270 |
| *Mid-age* | 0.673 | 0.593 | 0.724 | 0.660 |
| *Senior* | 0.245 | 0.288 | 0.159 | 0.069 |
| Education | | | | |
| *Low* | 0.000 | 0.000 | 0.012 | 0.039 |
| *Mid* | 0.530 | 0.695 | 0.694 | 0.676 |
| *High* | 0.469 | 0.305 | 0.294 | 0.286 |
| Income | | | | |
| *Low* | 0.510 | 0.508 | 0.571 | 0.571 |
| *Mid* | 0.490 | 0.492 | 0.429 | 0.429 |
| *High* | 0.102 | 0.085 | 0.118 | 0.124 |
| U.S. Census Region | | | | |
| *Northeast* | 0.184 | 0.136 | 0.188 | 0.220 |
| *Midwest* | 0.204 | 0.288 | 0.271 | 0.239 |
| *South* | 0.449 | 0.407 | 0.353 | 0.390 |
| *West* | 0.163 | 0.169 | 0.188 | 0.151 |
| Political Party | | | | |
| *Democrat* | 0.469 | 0.322 | 0.282 | 0.382 |
| *Republican* | 0.306 | 0.288 | 0.341 | 0.236 |
| In-group Identification | 3.617 | 3.885 | 3.885 | 3.617 |
| Illegal Aliens Scale | -0.327 | -0.373 | -0.465 | -0.050 |

**Table A3.4 (cont'd)**

| | t-Test for Differences across Classes (yes = significant at 0.10 level) | | | | | |
|---|---|---|---|---|---|---|
| Variable | 1 & 2 | 1 & 3 | 1 & 4 | 2 & 3 | 2 & 4 | 3 & 4 |
| Gender | No | No | Yes | Yes | Yes | No |
| Age | | | | | | |
| *Young* | No | No | Yes | No | Yes | Yes |
| *Mid-age* | No | No | No | Yes | No | No |
| *Senior* | No | No | Yes | Yes | Yes | Yes |
| Education | | | | | | |
| *Low* | No | No | Yes | No | Yes | Yes |
| *Mid* | Yes | Yes | No | No | Yes | No |
| *High* | Yes | Yes | No | No | Yes | No |
| Income | | | | | | |
| *Low* | No | No | No | No | No | No |
| *Mid* | No | No | No | No | No | No |
| *High* | No | No | No | No | No | No |
| U.S. Census Region | | | | | | |
| *Northeast* | No | No | No | No | No | No |
| *Midwest* | No | No | No | No | No | No |
| *South* | No | No | No | No | No | No |
| *West* | No | No | No | No | No | No |
| Political Party | | | | | | |
| *Democrat* | No | Yes | No | No | No | Yes |
| *Republican* | No | No | No | No | No | Yes |
| In-group Identification | Yes | Yes | Yes | No | No | Yes |
| Illegal Aliens Scale | No | No | Yes | No | Yes | Yes |

**Table A3.5** Latent Class Model Coefficient Estimates for U.S. Public's View on the Importance of Selected Production Practices in the Poultry Industry

| | Class 1: Highly educated | Class 2: Female | Class 3: Mid-age, non-Democrats | Class 4: Young and more pro I.A. |
|---|---|---|---|---|
| Production Practice | | | | |
| *AW_Meals* | 0.704*** | 2.083*** | 3.255*** | 0.313*** |
| | (0.155) [A] | (0.219) | (0.119) | (0.060) |
| *WW_Meals* | 1.886*** | 0.284 | 0.655*** | -0.072 |
| | (0.264) | (0.188) | (0.070) | (0.058) |
| *AW_Ver* | 1.806*** | -1.250*** | 2.371*** | -0.321*** |
| | (0.190) | (0.228) | (0.107) | (0.068) |
| *WW_Ver* | 2.513*** | -1.321*** | 1.775*** | -0.283*** |
| | (0.265) | (0.217) | (0.098) | (0.062) |
| *AW_Sick* | 0.903*** | 2.522*** | 3.475*** | 0.323*** |
| | (0.157) | (0.229) | (0.105) | (0.063) |
| *WW_Sick* | | Baseline Farm Practice (0.00) | | |
| *AW_Cage* | 0.921*** | 0.826*** | 3.047*** | -0.468*** |
| | (0.174) | (0.221) | (0.116) | (0.067) |
| *WW_Cage* | 1.707*** | 1.671*** | 1.983*** | 0.169*** |
| | (0.206) | (0.202) | (0.093) | (0.063) |
| *Flocksize* | 1.756*** | 0.819*** | 2.643*** | -0.429*** |
| | (0.206) | (0.224) | (0.115) | (0.063) |
| Membership Percent | 0.095%*** | 11.0%*** | 31.5%*** | 48.0%*** |
| Log Likelihood | | -19659.975 | | |
| Akaike Information Criterion | | 39389.950 | | |
| Bayesian Information Criterion | | 39327.061 | | |

[A] Standard errors are in parentheses. Asterisks (***, **, *) indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

# REFERENCES

# REFERENCES


5 questions about cage-free hen health, welfare, 2017 Egg Industry.

Aramark Establishes Animal Welfare Policy [WWW Document], n.d. URL https://www.aramark.com/about-us/news/aramark-general/aramark-establishes-animal-welfare-policy (accessed 7.29.19).

Auger, P., Devinney, T.M., Louviere, J.J., 2007. Using Best-Worst Scaling Methodology to Investigate Consumer Ethical Beliefs across Countries. Journal of Business Ethics 70, 299–326.

Bennett, R.M., 1997. Farm animal welfare and food policy. Food Policy 22, 281–288. https://doi.org/10.1016/S0306-9192(97)00019-5

Bennett, R.M., Blaney, R.J.P., 2003. Estimating the benefits of farm animal welfare legislation using the contingent valuation method. Agricultural Economics 29, 85–98. https://doi.org/10.1016/S0169-5150(03)00037-9

Breaks and Meal Periods | U.S. Department of Labor [WWW Document], n.d. URL https://www.dol.gov/general/topic/workhours/breaks (accessed 7.28.20).

Caputo, V., Lusk, J.L., 2020. What agricultural and food policies do U.S. consumer prefer? A best-worst scaling approach. Agricultural Economics 51, 75–93.

Chang, J.B., Lusk, J.L., Norwood, F.B., 2010. The Price of Happy Hens: A Hedonic Analysis of Retail Egg Prices. Journal of Agricultural and Resource Economics 35, 406–423.

Clark, B., Stewart, G.B., Panzone, L.A., Kyriazakis, I., Frewer, L.J., 2017. Citizens, consumers and farm animal welfare: A meta-analysis of willingness-to-pay studies. Food Policy 68, 112–127. https://doi.org/10.1016/j.foodpol.2017.01.006

Coalition for Sustainable Egg Supply, n.d. Final Research Results Report.

Ellison, B., Brooks, K., Mieno, T., 2017. Which livestock production claims matter most to consumers? Agric Hum Values 34, 819–831. https://doi.org/10.1007/s10460-017-9777-9

Finn, A., Louviere, J., 1990. Shopping-center patronage models: Fashioning a consideration set segmentation solution. Journal of Business Research, Special Issue Cutting Edge Research in Retailing 21, 259–275. https://doi.org/10.1016/0148-2963(90)90032-9

Grebitus, C., Lusk, J. L., and Nayga, R. M. 2013. Effect of distance of transportation on willingness to pay for food. Ecological economics, 88:67-75.

Greenhouse, S., 2015. Farm Labor Groups Make Progress on Wages and Working Conditions. The New York Times.

Heng, Y., Peterson, H.H., Li, X., 2013. Consumer Attitudes toward Farm-Animal Welfare: The Case of Laying Hens. Journal of Agricultural and Resource Economics 38, 418–434.

Kendall, H.A., Lobao, L.M., Sharp, J.S., 2006. Public Concern with Animal Well-Being: Place, Social Structural Location, and Individual Experience. Rural Sociology; Columbia 71, 399–428. http://dx.doi.org.proxy2.cl.msu.edu/10.1526/003601106778070617

Krinksy, I., Robb, A. 1986. One Approximating the Statistical Properties of Elasticities. The Review of Economics and Statistics 68, 715-719.

Louviere, J.J., Flynn, T.N., Marley, A.A.J., 2015. Best-worst Scaling: Theory, Methods and Applications. Cambridge University Press.

Lusk, J.L., 2010. The Effect of Proposition 2 on the Demand for Eggs in California.

Lusk, J. L. 2011. External validity of the food values scale. Food Quality and Preference, 22(5): 452-462.

Lusk, J.L., 2019. Consumer preferences for cage-free eggs and impacts of retailer pledges. Agribusiness 35, 129–148. https://doi.org/10.1002/agr.21580

Lusk, J.L., Briggeman, B.C., 2009. Food Values. American Journal of Agricultural Economics 91, 184–196.

Lusk, J.L., Tonsor, G.T., 2016. How Meat Demand Elasticities Vary with Price, Income, and Product Category. Applied Economic Perspectives and Policy 38, 673–711. https://doi.org/10.1093/aepp/ppv050

Lyons, P.A., Coursey, L.E., Kenworthy, J.B., 2013. National Identity and Group Narcissism as Predictors of Intergroup Attitudes Toward Undocumented Latino Immigrants in the United States. Hispanic Journal of Behavioral Sciences 35, 323–335. https://doi.org/10.1177/0739986313488090

Madison, J. 1787. Federalist No. 10: The Same Subject Continued: The Union as a Safeguard Against Domestic Faction and Insurrection. New York Daily Advertiser.

Malone, T., Lusk, J.L., 2016. Putting the Chicken Before the Egg Price: An Ex Post Analysis of California's Battery Cage Ban. Journal of Agricultural and Resource Economics 41, 518–532.

Marley, A.A.J., Louviere, J.J., 2005. Some probabilistic models of best, worst, and best–worst choices. Journal of Mathematical Psychology, Special Issue Honoring Jean-Claude Falmagne: Part 1 49, 464–480. https://doi.org/10.1016/j.jmp.2005.05.003

McKendree, M.G.S., Croney, C.C., Widmar, N.J.O., 2014. Effects of demographic factors and information sources on United States consumer perceptions of animal welfare. J Anim Sci 92, 3161–3173. https://doi.org/10.2527/jas.2014-6874

McKendree, M.G.S., Tonsor, G.T., Wolf, C.A., 2018. Animal Welfare Perceptions of the U.S. Public and Cow-Calf Producers. Journal of Agricultural and Applied Economics 50, 544–578. https://doi.org/10.1017/aae.2018.14

Minimum Length of Meal Period Required under State Law for Adult Employees in Private Sector 1 | U.S. Department of Labor [WWW Document], 2020. URL https://www.dol.gov/agencies/whd/state/meal-breaks (accessed 7.28.20).

National Population Totals and Components of Change: 2010-2019: Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2019 (No. NST-EST2019-01), 2019. U.S Census Bureau.

Nocella, G., Hubbard, L., and Scarpa, R. 2010. Farm animal welfare, consumer willingness to pay, and trust: results of a cross-national survey. Applied economic perspectives and policy, 32(2):275-297.

Ommundsen, R., Morch, S., Hak, T., Larsen, K.S., Veer, K.V.D., 2002. Attitudes toward illegal immigration: A cross-national methodological comparison. The Journal of Psychology; Provincetown 136, 103–10.

Partners – Fair Food Program [WWW Document], n.d. URL https://www.fairfoodprogram.org/partners/ (accessed 7.29.19).

Regmi, P., Deland, T.S., Steibel, J.P., Robison, C.I., Haut, R.C., Orth, M.W., Karcher, D.M., 2015. Effect of rearing environment on bone growth of pullets. Poult Sci 94, 502–511. https://doi.org/10.3382/ps/peu041

Regmi, P., Nelson, N., Steibel, J.P., Anderson, K.E., Karcher, D.M., 2016. Comparisons of bone properties and keel deformities between strains and housing systems in end-of-lay hens. Poult. Sci. 95, 2225–2234. https://doi.org/10.3382/ps/pew199

Scheiber, N., 2017. Ben & Jerry's Strikes Deal to Improve Migrant Dairy Workers' Conditions. The New York Times.

Semega, J., Kollar, M., Creamer, J., Mohanty, A., 2019. Income and Poverty in the United States: 2018 (No. P60-266). U.S Census Bureau.

Stone, J., Costanigro, M., Goemans, C., 2018. Public Opinion on Colorado Water Rights Transfers: Are Policy Preferences Consistent with Concerns over Impacts? Journal of Agricultural and Resource Economics 43, 403–422. https://doi.org/10.22004/ag.econ.276502

Strom, S., 2015. McDonald's Moving to Limit Antibiotic Use in Chickens. The New York Times.

Tucker P, 2003. The impact of rest breaks upon accident risk, fatigue and performance: a review. Work & Stress 17, 123–137. https://doi.org/10.1080/0267837031000155949

U.S. Census Bureau, n.d. U.S. Census Bureau QuickFacts: United States [WWW Document]. URL https://www.census.gov/quickfacts/fact/table/U.S./PST045219 (accessed 7.24.20).

Van Loo, E.J., Caputo, V., Nayga, R.M., Verbeke, W., 2014. Consumers' valuation of sustainability labels on meat. Food Policy 49, 137–150. https://doi.org/10.1016/j.foodpol.2014.07.002

Walmart U.S. Announces New Animal Welfare and Antibiotics Positions [WWW Document], n.d. . Corporate - U.S.. URL https://corporate.walmart.com/newsroom/2015/05/22/walmart-u-s-announces-new-animal-welfare-and-antibiotics-positions (accessed 7.29.19).

Wide Gender Gap, Growing Educational Divide in Voters' Party Identification, 2018. Pew Research Center.

Wolf, C.A., Tonsor, G.T., 2017. Cow Welfare in the U.S. Dairy Industry: Willingness-to-Pay and Willingness-to-Supply. Journal of Agricultural and Resource Economics; Logan 42, 164–179.

Wolf, C.A., Tonsor, G.T., 2013. Dairy Farmer Policy Preferences. Journal of Agricultural and Resource Economics 38, 220–234.

Wolf, C.A., Tonsor, G.T., Olynk, N.J., 2011. Understanding U.S. Consumer Demand for Milk Production Attributes. Journal of Agricultural and Resource Economics 36, 326–342.