THREE ECONOMIC ESSAYS ON THE U.S. MEAT AND POULTRY INDUSTRIES

By

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ABSTRACT

This dissertation focuses broadly on the U.S. domestic meat and poultry industries, more specifically on issues related to developing and adopting policies and programs for two niche markets – halal and farm animal welfare friendly. Halal meat and poultry products meet the religious dietary restrictions for Muslim consumers, specifically those related to the slaughter process for animals. The first two essays focus on the halal market, while the third focuses on farm animal welfare policy adoption.

The first chapter is concerned with meat and poultry processors' and retailers' decision-making patterns related to supplying halal meat and poultry in the U.S. domestic market. There has been strong ongoing demand growth for halal meat and poultry products in the U.S., but a relative dearth of processors and retailers entering the market to supply these goods. This essay seeks to understand if there are differences in preferences and business decision-making behavior between agents in the halal market and agents outside to suggest methods in which to increase market participation. To do this, I utilize a mixed methods design consisting of qualitative interviews with halal processors and retailers and survey data from halal and non-halal processors and retailers. My methodology consists of analyzing Likert scale data using descriptive statistics, principal components analysis, and k-means clustering to reveal patterns and group respondents for comparison. My results show that businesses that may expand into the halal market have been established longer and more likely to be retailers or further processors.

The second chapter focuses on market participants' preferences for designing a U.S. national halal meat and poultry certification program. The development of such a program serves as a potential solution to food fraud stemming from an overabundance of confusing and commonly contradictory certifications already in the market, similar to the issues that lead to the creation of

the USDA Organic standard. I again use a mixed methods approach of halal consumer, retailer, and processor qualitative interviews paired with national stacked surveys containing best-worst scaling questions to investigate preferences for the design of a U.S. national halal meat and poultry certification program. Results show that the market overall prefers that program designers consider most carefully Who/What is Certified, Halal Standards, and Costs. Additional results show preferences for which organizations should be involved in setting and/or enforcing this program, namely government (enforcement only), non-government, religious, and certifier organizations. Finally, the data indicated that multiple transparency and traceability measures should be included to ensure a robust and trustworthy program. In all, this chapter aids in bolstering halal meat consumer confidence in product authenticity and improves the equity of the U.S. food system.

The final chapter explores modeling of farm animal welfare regulation adoption across the U.S. In the U.S., 19 state-level bills and ballot initiatives concerning farm animal welfare (FAW) have been adopted across 12 states. In this chapter, I and my co-authors seek to model the evolution of the state-level FAW regulatory landscape as a function of legislature characteristics and constituent demographics. More specifically, we utilize a two-stage model known as a multinomial endogenous switching regression to assess whether and when a given state considers FAW measures, and if so, the likelihood the measures are passed. Using this model, we estimate the likelihood of FAW adoption for all 50 states. Additionally, we find that the cost to the egg and pork industries to upgrade to cage- and crate-free production methods in the states most likely to pass a FAW regulation in the future is small relative to the size of the industry. Our findings will assist producers and industry stakeholders in gauging the future of the regulatory landscape and provide guidance on whether to upgrade existing enclosures to comply with mandates on the horizon or to continue operating with "conventional" enclosures.

To my mom for her unwavering support and belief in me – not to mention her stellar proofreading skills.

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PREFACE

Islamic Dietary Laws

In order for a meat product to be *halal* – "permissible" for consumption – there are many qualifications that must be met; if they are not, the product is *haram*, or "forbidden." According to Bonne and Verbeke (2007, 2008), most practicing Muslims require halal certifications that ensure that Islamic dietary laws are followed at all stages of the supply chain. Islamic dietary restrictions are nuanced, and as with many religious texts, open to interpretation. Therefore, I detail only the most widely accepted views and dietary laws here.

Muslim teachings prohibit consumption of certain species or types of meat, namely pork and dead meat. Dead meat refers to an animal whose spinal cord is severed in the process of slaughter, rendering the heart unable to pump and thus the animal does not die of exsanguination. Additionally, animals must be raised on a natural, vegetarian diet that excludes filth or any animal proteins. Animals must be treated humanely; they must be well-nourished, not stressed before slaughter, the knife should not be sharpened in front of the animal, and no animal should witness the slaughter of another animal. Animals must be alive – both heart and brain still fully functioning – at the time of slaughter and must die of blood loss. As such, there is much debate about the use of electrical stunning prior to slaying an animal; many Muslims are opposed to the practice because of the risk of premature death, but it is common and considered humane in conventional U.S. slaughter.

Preferably, animals should be slaughtered by hand; machine slaughter is not fully accepted. The knife used should be sharp enough to kill the animal with one cut. The slaughter person must be a sane adult Muslim who invokes the name of Allah prior to each individual slaughter. Recordings of blessings that are played on loop are not recognized as halal. Finally, cross-

contamination with haram products renders halal products haram. As such, all steps of the

slaughter process and the following supply chain members must be certified halal.

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CHAPTER 1. PROCESSOR AND RETAILER MOTIVATIONS FOR HALAL MEAT AND POULTRY MARKET PARTICIPATION: PROFIT, PIETY, AND PURPOSE

1. Introduction and Motivation

Demand for halal meat and poultry (hereafter referred to as halal meat for brevity) products in the U.S. is growing quickly. The population of U.S. Muslim consumers is increasing rapidly and is projected to double by 2050, from about 3-5 million to 6-10 million people (Pew Research 2018). This growth in demand is in part due to immigration patterns that grow the consumer base, but also the vertical mobility by second and third generation Muslims who have begun to consume more meat products (Bereaud-Blackler 2004, Bonne & Verbeke 2007). Additionally, non-Muslim consumers have demonstrated demand for halal meat products (Campbell et al. 2011).

This rapid growth in demand for halal meat products represents an opportunity for U.S. meat processors and retailers to enter the market and expand halal meat availability. Despite this strong demand and the corresponding opportunities, domestic supply of halal meat products is relatively low. Further, halal meat and poultry products are not readily available outside of major metropolitan areas or areas with relatively concentrated Muslim populations. Considering this largely untapped market opportunity, this chapter addresses several research questions. First, how did current halal meat retailers and processors decide to offer halal meat products in their stores? Are there incentives and barriers that exist when entering the halal meat market, and how do these retailers and processors perceive them? Further, what motivations do current halal meat retailers and processors have for supplying [certified] halal meat? Taking this research one step further, how do the answers to these questions change for non-halal meat processors and retailers, and what comparisons can be made?

As with any market, participants face incentives and barriers to entry; thus, understanding how participants view these incentives and barriers is essential to devising policies to increase halal market participation. Compounding these aspects, the U.S. domestic halal meat market has multiple religious community considerations in addition to the usual pecuniary motivations that influence processor and retailer decision making in specialty market participation.

The U.S. domestic halal meat and poultry market is understudied. To my knowledge, there is no agricultural economic academic research published to date that focuses on the U.S. halal market. However, there is a recent study discussing religiosity and minority community behavioral patterns and their relation to Muslims' desires to consume halal meat (Mumuni et al 2018). The majority of agricultural economic research into the supply side of halal meat markets has been conducted in Europe (e.g., Ahmed 2008, Fuseini et al. 2017, Fuseini et al. 2021, Lever et al. 2010, Lever & Miele 2012, Masudin et al. 2020, Tieman et al. 2012), Southeast Asia (e.g., Ab Rashid & Bojei 2019, Salindal 2019, Shahijan et al. 2014, Tieman et al. 2012,), Australia (e.g., Zulfakar et al. 2013, Zulfakar et al. 2018, Zulfakar et al. 2019), and Brazil (e.g., de Araújo 2019). In general, these papers find that there are hurdles to halal meat market participation – including obtaining certifications, implementing halal slaughter and processing methods, and ensuring supply chain integrity. However, they also note that the benefits to supplying halal meat products are numerous, including entry into niche markets, the ability to charge a price premium, stronger transparency in the meat supply chain, and access to export markets. The U.S. meat market faces many of the same obstacles and has the potential to reap many of these benefits.

Research into the U.S. meat sector in general has uncovered several barriers to and incentives for market entry. Barriers include strong regulatory standards and food safety regulations that can be daunting to potential entrants (Worosz et al. 2008); for halal and other

specialty or niche meat sectors, these standards include additional regulations and requirements to achieve certification, likely compounding these issues. Additionally, there are issues related to labor shortages and the seasonality of the livestock slaughter and processing industry (Lewis & Peters 2011, Choe 2023), which can lead to logistical challenges for processors. However, research in New England found that livestock producers commonly demanded more slaughter and processing capacity than regional slaughterhouses were able to supply (Lewis & Peters 2011), which suggests there is room for more processors in the market. Indeed, during the height of the COVID-19 pandemic, processing capacity was a concern, largely due to continued labor shortage concerns related to virus transmission and policies and regulations impacting supply chain resiliency (Hobbs 2021, Ijaz et al. 2021, Larue 2021, Taylor et al. 2020, Weersink et al. 2021). Thus, there are multiple incentives to market entry, including major market opportunities and government grant programs – such as the 2022 Meat and Poultry Inspection Readiness Grant (MPRIG) – designed to offset the cost of inspected meat processing for small and very small meat processors (USDA-AMS 2022).

This essay contributes to the literature in several ways. First, this study serves to define the baseline for the current state of the industry for future work, given the dearth of research on the U.S. domestic halal meat supply chain. Second, this research contributes to a better understanding of the motivations and attitudes of current halal meat processors and retailers towards market participation, as well as the barriers to and incentives for entry they face(d). Additionally, it is the first-ever evaluation of *non*-halal processors' and retailers' pecuniary and non-pecuniary motivations for their decision to *not* enter the halal meat market, including their perceptions of barriers to and incentives for halal meat market entry. This assessment provides necessary identification of common concerns, misconceptions, and other factors dissuading processors and

retailers from entering the U.S. domestic halal meat market that can potentially be addressed through increased outreach and education. Further, by utilizing a mixed methods approach with active stakeholder engagement to ensure supply-side market participants' concerns and opinions are heard and incorporated into study design, this chapter expands the current body of literature on addressing systemic inequities in the U.S. food system. In all, this work contributes to efforts to promote equitable access to food for Muslim consumers through investigating methods to increase the supply of authentic halal meat products nationwide.

2. Research Methods

The unique religious and niche nature of the halal market, coupled with the lack of research to understand the behavior of U.S. halal meat suppliers requires a methodological approach allowing for exploration and learning feedback. As such, I use a mixed methods approach composed of both qualitative and quantitative components. The qualitative component consisted of in-depth semi-structured interviews with halal meat and poultry market participants – halal meat and poultry processors and retailers, as well as Muslim halal meat and poultry consumers. The quantitative component consisted of nationwide online surveys to collect further data; the structure and content of these surveys was informed by the data obtained in the qualitative interviews.

The synergy between methods is exhibited in two ways. In the first stage of this project, I formally interviewed multiple halal meat processors and retailers; interviews were qualitative and open-ended. These interviews were necessary to learn about the current state of the industry and understand the nuances of market participation, halal production methods, and product certification. I used these conversations to inform the development of the second stage of this project – further narrowing my research questions and the design of the quantitative data collection tools. From the qualitative interviews, I determined the most appropriate research questions to

explore in relation to halal meat processing and retailing revolve around barriers and incentives to market participation, as well as perceptions of halal meat. This focus led me to decide that my quantitative data collection should utilize Likert scale type survey questions to measure perceptions of barriers and incentives to entry, as well as survey questions to benchmark current levels of knowledge about halal meat. The data from the quantitative portion of this chapter is analyzed and interesting, unexpected, or particularly important results are highlighted and discussed in the context of information collected from the qualitative interviews. In this manner, the research comes full circle and incorporates findings from both methodologies throughout the project.

The two components of this chapter's methods are described in more detail in the next subsections.

2.1 Phase 1: Qualitative Exploration of U.S. Domestic Halal Meat and Poultry Industry

The qualitative portion of this study was designed using suggested methods from Patton (2014), Rubin and Rubin (2011), and Maxwell (2012). Interview questions were grouped by topic/area of interest and were open-ended to allow interviewees room for robust answers (Rubin and Rubin 2011). These qualitative interviews were crucial components of this study; they provided the opportunity to obtain information about the U.S. domestic halal meat and poultry industry previously unknown to me, as this market is understudied. Information collected via qualitative interviews included retailers' and processors' motivations for supplying halal meat and their preferences between different certifications to use in their operations. Collecting information directly from market participants in this way allowed me to design a more robust and relevant research program for the quantitative portion of this project. The qualitative interviews also provided vital context and explanatory power for the quantitative survey findings. The interview

guide for these qualitative interviews, information for how interviews were conducted, and the outline of the interview analysis process are found in Appendix A.1.

Interviewees were recruited from lists of retailers and processors registered as certified to supply halal meat by a reputable halal meat certification organization active in the industry for two decades. These lists are available on the certification organization's website. The interview candidates were narrowed to those in Midwestern states for ease of access and improved likelihood of name recognition for Michigan State University. A series of eight in-depth, semi-structured interviews with Midwestern halal meat retailers and 10 in-depth, semi-structured interviews with Midwestern halal meat processors were conducted December 2021 through April 2022.

2.2 Phase 2: Online Survey Methods for Further Exploration of Themes

The second stage of this chapter involves conducting two national online surveys, one with a sample of meat retailers and another with meat processors. The goal of these surveys is to elicit nationally representative opinions related to the information collected and to dig deeper into the common themes discovered via the qualitative interviews. The sample for both retailers and processors included those who currently offer halal products and those that do not. Including both current halal meat market participants and those outside the market is important to be able to compare differences in motivations and perceived barriers and incentives. This comparison will allow us to understand what could increase market participation by meat processors and retailers. Potentially, the results will inform policies to increase market participation, thereby increasing supply of halal meat products and fulfilling demand. Each survey includes Likert scale questions to elicit participants' attitudes towards different incentives and barriers to supplying halal meat and poultry products and using halal certifications. The surveys also included questions about

participant and business demographics, with emphasis on religious and cultural demographic information.

In the qualitative interviews, the majority of halal meat processors and retailers described strong support for increased certification utilization across the halal meat supply chain. Muslim processors and retailers discussed the importance of supplying halal meat to support their cultural and religious community members, while non-Muslim owners cited access to niche markets as a motivation for supplying halal meat products. Along these lines, most of the processors interviewed expressed interest in adopting new traceability strategies – including certifications, blockchain, and revised (electronic) paperwork for inventory – in their operations to strengthen the integrity of their operation and the halal meat market in general. Additionally, processors and retailers reported a variety of barriers to and incentives for halal meat market participation that influenced their decision making. Barriers or challenges related to halal meat market participation included racial, ethnic, cultural, or religious biases and discrimination, limited access to financial assistance such as Islam-compliant business loans, input shortages, and fraudulent competition. Incentives included a desire to supply a necessary niche product to their community, the conviction that financially supporting themselves/their families through halal methods was morally correct, the belief that they are supplying a higher quality product, and the opportunity to access a niche market.

Thus, the areas of interest for Likert scale questions were selected based on common themes from the Phase 1 qualitative interviews. These qualitative interview findings suggested that the Likert scale questions in the quantitative survey should be designed to include questions to evaluate participants' attitudes towards potential barriers and incentives to halal meat market participation and their knowledge of halal meat religious requirements. An example of these

questions for retailers and processors are included in Figure 1, Figure 2, Figure 3, and Figure 4. Participants selected how likely each option was or would be an incentive (motivation) or disincentive (barrier) for adding a halal program to their operations.

Finally, members of the Islamic community were asked to look over the survey for clarity and to ensure there were no misrepresentations prior to distribution. Both the processor and retailer surveys in entirety can be found in Appendix A.2.

Figure 1: Example Likert Scale Questions for Halal Retailing Incentives

Please indicate to what extent each of the following **_MOTIVATED_** your store to start a **_halal_** program:

	Not a motivation	Neutral	A motivation
Higher retail margin for **_halal_** products	○	○	○
Access to new customers to sell **_halal_** products	○	○	○
Supplying niche religious products to minority communities	○	○	○

	Not a motivation	Neutral	A motivation
The ability to compete with other similar businesses that offer **_halal_** meat/poultry products	○	○	○
Assistance from organizations (certifiers, producer groups, etc.) to coordinate finding a supplier	○	○	○

Figure 2: Example Likert Scale Questions for Halal Processing Incentives

Please indicate how likely each of the following are to **_INCENTIVIZE_** you to add a _halal_ program to your establishment:

	Unlikely	Neutral	Likely
Higher price for my products	O	O	O
Access to new markets to sell my products	O	O	O
Supplying niche religious products to minority communities	O	O	O
The ability to apply for grants or financial aid to help set up the program	O	O	O
Assistance from organizations (certifiers, universities, etc.) to coordinate setting up the halal program	O	O	O
Competing with similar businesses that have a halal program	O	O	O

Figure 3: Example Likert Scale Questions for Barriers to Halal Retailing

Please indicate to what extent each of the following **_MOTIVATED_** your store to start a _halal_ program:

	Not a motivation	Neutral	A motivation
Higher retail margin for _halal_ products	O	O	O
Access to new customers to sell _halal_ products	O	O	O
Supplying niche religious products to minority communities	O	O	O
	Not a motivation	Neutral	A motivation
The ability to compete with other similar businesses that offer _halal_ meat/poultry products	O	O	O
Assistance from organizations (certifiers, producer groups, etc.) to coordinate finding a supplier	O	O	O

Figure 4: Example Likert Scale Questions for Barriers to Halal Processing

Please indicate how likely each of the following serve as a **_BARRIER_** in your decision to add a **_halal_** program to your establishment:

	Unlikely	Neutral	Likely
Costs associated with certification program involvement (certification fees, infrastructure, traceability technology materials, labor, etc.)	O	O	O
Religious or racial discrimination from regulating bodies	O	O	O
Backlash or displeasure from my non-Muslim customers	O	O	O
Lack of Muslim laborers available near me	O	O	O
Limited local market opportunities to sell my product	O	O	O
Lack of knowledge for how to implement a halal program at my operation	O	O	O

3. Quantitative Data Collection Process

3.1 Data Collection Process & Summary Statistics

Surveying supply-side agents is notoriously difficult relative to surveying consumers. Typically, supply-side studies receive a very low number of responses, due to a variety of reasons – a smaller population to sample from, a lack of relevant pre-established survey panels, and the opportunity cost of a business owner's time being just a few. Nevertheless, I conducted multiple efforts over many months to contact and obtain survey responses from both the processor and retailer populations for this study; details on these efforts are given below.

3.1.1 Processor Sample and Data Collection

I recruited processor participants from three sources: 1) USDA Food Safety and Inspection Service (FSIS) list of registered meat processors, 2) registered processors on Halal Monitoring Services' (HMS) website, and 3) the American Association of Meat Processors (AAMP). Poultry, lamb, beef, and goat processors were included in the sample – I excluded processors that only processed pork since the species is not acceptable for consumption in Islam. While the processors listed on HMS' website are known to be halal, it is also likely that some processors on the USDA FSIS database and the AAMP membership list also process halal meat or poultry products, though the exact number is unknown.

The USDA FSIS database lists all 6,788 USDA-inspected processing establishments. Removing pork-only, siluriform-only, and egg-only facilities left 5,859 establishments. Of these establishments, 2,736 are classified as "very small" by the USDA with less than 10 employees or less than $2.5 million in annual sales, 2,656 are classified as "small" by the USDA with 10-499 employees and 440 are "large" establishments with 500 or more employees. I conducted stratified random sampling of the three groups of establishments in the USDA FSIS data file, using Excel to generate random number lists to select establishments from the populations. As very small, small, and large processors make up 46.7%, 45.3%, and 7.5% of the total population, respectively, these percentages were used to determine how many establishments to sample from each group. There were 1,049 processors contacted from the USDA FSIS database including 20 large processors, 451 small processors, and 578 very small processors. Establishments were called by a team of undergraduate research assistants beginning in early November 2022 to determine who at the establishment should respond to the survey and obtain email addresses. Email addresses for

establishments without a phone number listed or those that did not answer or return calls were retrieved from business websites when available.

Individual Qualtrics survey URLs were sent via email to the USDA FSIS sample. The first round of emails was sent using MS Word mail merge on December 9, 2022, with follow-up reminder emails on December 13 and 16, 2022. The next reminder email was sent using Constant Contact on January 11, 2023. From the first round of emails, approximately 50 bounced back as undeliverable, and 12 businesses responded saying they did not qualify or would not be taking the survey. Thus, a total of 987 processors from the USDA FSIS list received the survey.

There were an additional 58 registered processors on the HMS website which were all included in the sample. Emails were obtained from the certifier, and individualized Qualtrics survey URLs were sent using MS Word mail merge in January 2023, with follow-up reminder emails in January and February 2023. Additionally, these processors were given the option to take the survey in either Arabic or Urdu if they preferred.

The AAMP membership list was contacted via an association representative, who distributed an anonymous Qualtrics survey URL to the membership email listserv in March 2023, with reminder emails in March and April 2023. It is likely that many AAMP members received the survey who also were included in my USDA FSIS recruitment efforts. However, the response rate for both samples was very low, so I do not anticipate there were any duplicate survey responses.

Despite contacting businesses in three different samples, I received only 195 total responses, with only 95 remaining after data cleaning. I received responses mainly from very small, small, and medium processing plants, both because these make up over 90% of meat

processors in the nation and, anecdotally, because larger processors typically do not respond to surveys. Summary statistics and a discussion of valid responses is presented later in this chapter.

3.1.2 Retailer Sample and Data Collection

Non-halal and halal meat retailers were recruited between February 2023 and October 2023. Non-halal retailers were recruited via multiple state-level grocers associations and from a membership list from the National Grocers Association (NGA). First, I attempted to recruit retailers via the state-level grocers associations and the NGA email listservs with the assistance of association representatives. However, only 18 responses were received via these efforts, so another recruitment approach was needed. In May of 2023, a team of undergraduate research assistants called retailers from the 2019 winter NGA membership list (National Grocers Association 2019) – the most recent available online – between May 2023 and September 2023 to collect point of contact email addresses. After removing closed businesses, a total of 946 retail stores were called, and 236 email addresses were obtained. As in the processor case, it is possible that some of these retailers actually did have a halal program at the time of the survey, though the exact number of these stores is unknown.

Known halal retailers were recruited from halal certifiers' online lists of registered businesses and through a nationwide web scraping of Yellow Pages using the following key terms and phrases: "halal meat grocery store," "halal meat," "Indo-Pak grocery," "African grocery," and "international grocery store." The results of the web scraping were compiled, then duplicates, unrelated businesses, and closed businesses were removed from the list. A team of undergraduate research assistants called the remaining 919 stores between July 2023 and October 2023 to collect email contact information; 96 email addresses were obtained.

Emails with survey links were sent three times to each category of retailers between August 25 and October 10, 2023. Incentive payments of $25 were offered for complete and quality responses, though not all respondents claimed their incentive. In total, 50 responses were collected from the retailer samples, and after data cleaning, 39 viable survey responses remained.

4. Quantitative Analysis Methods

The Likert scale data collected from the surveys was analyzed using three methods: Count data and descriptive statistics, principal component analysis (PCA), and k-means clustering. The data in this study consists of two small samples from related populations – meat and poultry processors and retailers. While there are certainly similarities between businesses within each of these two populations (e.g., retailer-to-retailer or processor-to-processor), I am interested in similarities and differences between businesses across these two populations (e.g., retailer-to-processor). Specifically, I am interested in ascertaining classifying businesses by their patterns of behavior so that generalizations based on these classifications can be made and used to prescribe potential methods to increase halal meat market participation. Thus, I first present an overall summary of the data collected by establishment type (processor or retailer) and halal status using descriptive analysis. Then, I undertake a more complex statistical analysis by pooling the data and conducting PCA and k-mean clustering on the combined data to generate variables (PCs) and sort businesses based on these common characteristics (k-means).

4.1 Principal Components Analysis Statistical Framework

There are multiple methods, including econometric regressions, available to analyze Likert scale data; however, the data in this study requires a method that can handle both multicollinearity between large numbers of variables and a relatively small sample size. The analysis method that best fits this description is PCA, which is commonly used to condense high-dimensional Likert

scale responses into a lower-dimensional form to identify overlapping variability in the sample. PCA and k-means clustering are commonly used together for statistical analysis of multi-dimensional data sets. K-means clustering has been used in conjunction with PCA to identify market segments for agricultural products including seafood (Hanson et al. 1994), apples (Bejaei et al. 2020), and beer (Malone & Lusk 2018, and has been popular in the marketing and data-mining literature (Arabie & Hubert 1996). It is used to group similar participants without requiring large sample sizes nor some of the more rigorous assumptions required by discrete choice experiments and conjoint analysis (Arabie & Hubert 1996).

PCA was first developed in the early 1900s, when Pearson (1901) and Hotelling (1933) endeavored to mathematically define patterns in data to describe large numbers of variables using a smaller subset of independent variables. These independent variables – the principal components – are chosen to maximize their explanatory power for the total variance of the original variables, and the components that are derived in this way were termed 'principal components.' In the successive century since PCA was developed, thousands of studies and papers across all fields of science have used this method to condense complex data to discover important patterns (e.g., Hsu et al. 2009, Sinha et al. 1969, Calder et al. 2001).

PCA is an orthogonal linear transformation; it translates higher-dimensional data into a lower-dimensional coordinate system so that the first coordinate – that is, the first principal component (PC1) – represents some linear projection of the greatest variance of the data. Additional principal components (e.g., PC2 and PC3) would lie on the second, third, and so forth coordinates with their corresponding second, third, and so forth greatest variances in the data. The underlying concepts and procedures are illustrated mathematically below.

Suppose that I have a random vector:

$$X = \begin{pmatrix} X_1 \\ X_2 \\ \vdots \\ X_p \end{pmatrix}$$

with population variance-covariance matrix

$$var(X) = \Sigma = \begin{pmatrix} \sigma_1^2 & \cdots & \sigma_{1p} \\ \vdots & \ddots & \vdots \\ \sigma_{p1} & \cdots & \sigma_p^2 \end{pmatrix}$$

Consider the linear combinations, each of which can be thought of as a linear regression predicting Y_i from $X_1, X_2, \ldots, X_p$:

$$Y_1 = e_{11}X_1 + e_{12}X_2 + \cdots + e_{1p}X_p$$

$$Y_2 = e_{21}X_1 + e_{22}X_2 + \cdots + e_{2p}X_p$$

$$\vdots$$

$$Y_p = e_{p1}X_1 + e_{p2}X_2 + \cdots + e_{pp}X_p$$

Since the Y_i are functions of random data, I have:

$$var(Y_i) = \sum_{a=1}^{p} \sum_{b=1}^{p} e_{ia}e_{ib}\sigma_{ab} = e_i' \sum e_i$$

$$cov(Y_i, Y_j) = \sum_{a=1}^{p} \sum_{b=1}^{p} e_{ia}e_{jb}\sigma_{ab} = e_i' \sum e_j$$

Now, the first principal component (PC1) accounts for as much variation in the data as possible. It is expressed as the linear combination of x-variables that has maximum variance among

all the linear combinations. I must maximize the variance subject to the constraint that the sum of the squared coefficients e_1 equals one. Expressed mathematically this is:

$$var(Y_1) = \sum_{a=1}^{p} \sum_{b=1}^{p} e_{1a} e_{1b} \sigma_{ab} = e_1' \sum e_1$$

Equation 5

such that:

$$e_1' e_1 = \sum_{a=1}^{p} e_{1a}^2 = 1$$

Equation 6

Additional principal components are computed in much the same way, with the added constraint that the components are uncorrelated. That is, for the ith PC, I find the vector e_i of coefficients to solve:

$$var(Y_i) = \sum_{a=1}^{p} \sum_{b=1}^{p} e_{ia} e_{ib} \sigma_{ab} = e_i' \sum e_i$$

Equation 7

such that

$$e_1' e_1 = \sum_{a=1}^{p} e_{1a}^2 = 1$$

Equation 8

and

$$cov(Y_1, Y_i) = \sum_{a=1}^{p} \sum_{b=1}^{p} e_{1a} e_{jb} \sigma_{ab} = e_1' \sum e_i = 0$$

$$cov(Y_2, Y_i) = \sum_{a=1}^{p} \sum_{b=1}^{p} e_{2a} e_{jb} \sigma_{ab} = e_2' \sum e_i = 0$$

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$$\vdots$$

$$cov(Y_{i-1}, Y_i) = \sum_{a=1}^{p} \sum_{b=1}^{p} e_{i-1a} e_{jb} \sigma_{ab} = e'_{i-1} \sum e_i = 0$$

<div align="right">*Equation 9*</div>

To solve for the coefficients e_{ij}, I must use the eigenvalues and eigenvectors of the variance-covariance matrix Σ. Letting $\lambda_1 \geq \lambda_2 \ldots \geq \lambda_p$ be the eigenvalues of Σ and $\boldsymbol{e_1}, \boldsymbol{e_2}, \ldots, \boldsymbol{e_p}$ be the corresponding eigenvectors, I have that the elements for the eigenvectors are the PC coefficients. Additionally, the variance of the ith PC is equivalent to the ith eigenvalue:

$$var(Y_i) = var(e_{i1}X_1 + e_{i2}X_2 + \cdots + e_{ip}X_p) = \lambda_i$$

<div align="right">*Equation 10*</div>

Now, to obtain the principal components of a sample of our data, I must compute the corresponding sample eigenvalues $\hat{\lambda}_i$ and eigenvectors $\boldsymbol{\hat{e}_i}$ of the sample variance-covariance matrix **S.** I can then define each estimated PC as a linear combination using the eigenvectors as coefficients:

$$\hat{Y}_1 = \hat{e}_{11}X_1 + \hat{e}_{12}X_2 + \cdots + \hat{e}_{1p}X_p$$

$$\hat{Y}_2 = \hat{e}_{21}X_1 + \hat{e}_{22}X_2 + \cdots + \hat{e}_{2p}X_p$$

$$\vdots$$

$$\hat{Y}_p = \hat{e}_{p1}X_1 + \hat{e}_{p2}X_2 + \cdots + \hat{e}_{pp}X_p$$

<div align="right">*Equation 11*</div>

In PCA, I seek to retain minimal PCs so that the proportion of the variance is described by the first g PCs is large and ideally close to one. That is:

$$\frac{\hat{\lambda}_1 + \hat{\lambda}_2 + \cdots + \hat{\lambda}_g}{\hat{\lambda}_1 + \hat{\lambda}_2 + \cdots + \hat{\lambda}_p} \cong 1$$

Equation 12

This allows us to obtain the simplest possible relationship between the original data and the new, condensed variables (the PCs). If the first few PCs explain a small amount of variation, I need more of them to explain a desired percentage of total variance resulting in a large *g*. To determine the number of PCs for this study, I retained any PC that accounts for at least 10% of the common variance (Malone and Lusk 2017).[1]

4.2 K-means Clustering Motivation and Statistical Framework

K-means clustering is advantageous for analyzing the data in this study because it is straightforward to implement and interpret – preferable attributes for performing an exploratory study. Additionally, k-means clustering is ideal as it segments the market into groups that exhibit common views.

Given the exploratory nature of this study, I conduct simple nonhierarchical cluster analysis where individuals are grouped using the least squares method to minimize the Euclidean distance within a specified *k* number of groups or clusters. This algorithm partitions the data space in a way so that data points within the same cluster are as similar as possible (intra-class similarity) with respect to their PC scores, while data points from different clusters are as dissimilar as possible (inter-class similarity). In k-means, each cluster is characterized by its centroid, which is the arithmetic mean of the data points assigned to the cluster, but it might not be a member of the dataset. K-means randomly selects data points as possible centroids of the clusters and then

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[1] I used the principal components analysis commands in Stata to conduct this analysis, using the nine common Likert scale questions between the processor are retailer surveys as the independent variables for which to develop the PCs from. I did not use an orthogonal rotation method, as I am not using PCA to compare across different scales or groups of questions in the data. Specifically, the code used was: pca PricePremium - LackKnowledge

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iteratively recalculates new centroids to converge to a final clustering of the data points. K-means

assigns every data point in the dataset to the nearest centroid, meaning that a data point is in a

given cluster if it is closer to that cluster's centroid than any other centroid. The algorithm repeats

the selection of centroids and sorting of data points until the sum of distances between data points

and their given centroid is minimized, the maximum number of iterations is reached, or there are

no changes in centroid values.[2]

The Likert scale data resulted in a 9-dimensional space. I indexed this data using the three

PCs, and then partition the observations into three groups (clusters) based on their PC values. As

such, the specific objective of this cluster analysis is to minimize the within-group variation of the

PC values. Specifically, the k-means method in our context minimizes the squared distance from

each observation (x_i) to the center of the observation's associated cluster ($\bar{X}_{ik}$):

$$\min(distance_x) = min\sqrt{\sum_{i=1}^{8}(x_i - \bar{X}_{ik})^2}$$

Equation 13

Once I select the k PCs that best describe most of the variance, I use these PCs as

independent variables on which to cluster or "sort" individuals into groups based on their

individual predicted PC values. After condensing the data in this manner, k-means clustering is

applied to group the observations into clusters that exhibit similar response patterns. That is, rather

than grouping variables as is done in PCA, cluster analysis allows us to group people – or in our

case, businesses. In this study, cluster analysis will combine all participants' responses and then

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[2] I conducted k-means cluster analysis in Stata using the cluster kmeans command on the three PCs selected from the PCA to sort the data into three groups with a set starting seed value and a maximum of 1,000,000 iterations. In particular, the code used is: cluster kmeans pc1 pc2 pc3, k(3) name(threegroups) start(random(12281996)) iterate(1000000)

sort them into new groups; I anticipate this segmentation will group some non-halal processors and retailers with their halal counterparts, revealing what common characteristics of non-halal businesses are most suitable to future expansion into the halal market.

To determine the unique characteristics of the different market segments created via k-mean clustering, F-tests on the means between groups for each demographic category are conducted. Values with 10% or stronger statistical significance are then evaluated with pairwise t-tests to discover more specific differences between the groups. Ultimately, this will allow for policy prescriptions tailored to their unique positions in the market that are not easily seen when analyzing participants within their original (halal versus non-halal) categories.

5. Summary Statistics

The summary statistics of respondents are given by business type in the following subsections.

5.1 Processor Summary Statistics

The processor survey received 195 responses. After dropping ineligible and responses that were less than 50% complete, 95 responses remained. Establishments represented in this data are in 39 states.[3]

5.1.1 Processor Respondent Characteristics

Summary statistics of processor respondent characteristics are given in Table 1. Respondents were mainly male and white. The majority had at least a 4-year college degree. When asked their political affiliation, most said they were Republicans or Independents, although 31%

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[3] The states represented in the data are Alabama, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

opted not to disclose their political affiliation. Twenty-one percent indicated they were second-generation immigrants (i.e., their parent(s) were born outside of the U.S., but they were born in the U.S.). Immigration information is relevant to this study, as more recent immigrants or younger generations of immigrants are more likely to identify with and participate in the cultural and religious heritage from their home or ancestral country (Lopez 2017). The most recent waves in immigration of Muslims to the U.S. occurred in the 1980s and in the 2000s onward, as the U.S. relaxed immigration laws and civil unrest and climate catastrophes in the Arab world and Southeast Asia contributed to a refugee crisis (Carmichael 2020); as such, it is possible that more younger generations of immigrants are active in the halal meat and poultry supply chain. Further, 21% of the sample indicated they are religious. As halal is a religious product, this information is potentially important for understanding processors' motivations - or lack thereof - for providing halal products.

Table 1: Processor Respondent Summary Statistics

Category	Percent
Gender (n = 94)	
Male	76%
Female	19%
Prefer not to disclose	5%
Education Level (n = 94)	
High School	6%
Some College	13%
2-Year Degree (Associates)	10%
4-Year Degree (Bachelor's)	44%
Master's Degree	22%
Professional Degree	5%
Race (n = 94)	
White	76%
Black	1%
Native American or Alaskan Native	0%
Native Hawaiian or Pacific Islander	0%
Asian	3%
Other	6%
Prefer not to disclose	14%
Hispanic (N = 93)	
No	89%
Yes	3%
Prefer not to disclose	8%
Political Party (N = 94)	
Democrat	5%
Republican	35%
Independent	26%
Other	3%
Prefer not to disclose	31%
2nd Generation Immigrant (N = 94)	
No	66%
Yes	21%
Prefer not to disclose	13%
Currently Religious (N = 94)	
Yes	21%
No	56%
Prefer not to disclose	22%
Previously Religious (N = 20)	
Yes	45%
No	40%
Prefer not to disclose	15%

5.1.2 Processor Establishment Characteristics

Processing establishment summary statistics are given in Table 2. Establishments represented in the sample consisted of facilities that slaughtered, processed, both slaughtered and processed, or conducted other meat and poultry product handling ("other"). Seven percent of respondents only slaughtered meat or poultry, 44% of respondents only processed meat or poultry, 45% both slaughtered and processed meat or poultry products, and 3% of respondents conducted other meat and poultry product handling. Most respondents represented very small or small processors; the mean and median business size of our sample was 62 and 20 employees, respectively. This is not surprising, as over 95% of meat and poultry processing establishments in the U.S. are small or very small per USDA standards. On average, these establishments had been open for 31 years. Unsurprisingly, given the nature of meat and poultry processing, 48% of respondents indicated their establishment is in a rural area.

Many slaughter and processing establishments handle multiple species. Of the 95 establishments in our sample, 83% indicated they handled beef, 34% veal, 55% lamb, 46% pork, 35% turkey, 38% chicken, 55% goat, and 35% handled exotics (game, specialty poultry, etc.).

Respondents were asked if they currently or had ever slaughtered, processed, or handled halal meat or poultry products. Thirty-four percent responded they were currently operating a halal program, 4% had previously had a halal program but did not currently, and 62% indicated they had never operated a halal program at their establishment.

Table 2: Processing Establishment Summary Statistics, N = 95

Category			Percent	
Establishment Type				
Slaughter without processing			7%	
Processing without slaughter			44%	
Slaughter and processing			45%	
Other			3%	
Location				
Rural			48%	
Suburban			23%	
Urban			23%	
Prefer not to disclose			6%	
Type of Animal				
Beef			83%	
Veal			34%	
Lamb			55%	
Pork			46%	
Turkey			35%	
Chicken			38%	
Goat			55%	
Exotics			35%	
Halal Status				
Current Halal			34%	
Past Halal			4%	
Never Halal			62%	
Number of Employees	**Mean**	**Median**	**Min**	**Max**
	62	20	2	850
Year Established	**Mean**	**Median**	**Min**	**Max**
	1992	2001	1902	2022

Looking more specifically at the 32 establishments that reported currently operating a halal program, over three-quarters indicated they have a zabiha (hand-slaughtered) halal program (Table 3). Further, over one-half of these establishments reported operating a halal program for more than 7 years. Most of these establishments are certified by a third-party halal certification group, which is not surprising given our sampling strategy. For operations that conduct halal slaughter or processing, most reported that halal slaughter or processing was over 50% of their operation.

Table 3: Current Halal Establishment Summary Statistics, N = 32

Category	Percent
Halal slaughter method	
Zabiha	77%
Machine	6%
Unsure/Don't know	16%
Years operating a halal program	
< 1 year	6%
1-3 years	29%
4-6 years	13%
7-10 years	16%
11-20 years	13%
> 20 years	23%
Certified by 3rd party	
Yes	78%
No	16%
Unsure	6%
Percent of slaughter that is halal	
< 10%	9%
11-25%	4%
26-50%	4%
50-75%	74%
> 75%	9%
Percent of processing that is halal	
< 10%	24%
11-25%	12%
26-50%	4%
50-75%	4%
> 75%	56%

5.2 Retailer Summary Statistics

The retailer survey received 50 responses. After dropping ineligible responses and responses that were less than 50% complete, 41 responses remained. The survey was distributed nationwide; stores represented in this data are located in 21 states.[4]

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[4] The states represented in the data are Alaska, California, Hawaii, Illinois, Indiana, Maine, Maryland, Massachusetts, Michigan, Montana, Nebraska, New Jersey, North Carolina, North Dakota, Ohio, Rhode Island, South Dakota, Texas, Utah, Virginia, and Wisconsin.

5.2.1 Retailer Respondent Characteristics

Retailer respondent demographic summary statistics are given in Table 4. Like in the processor survey, respondents were mainly male and white, and the majority had at least a bachelor's degree. When asked their political affiliation, most indicted they were Republicans or Independents, although 24% opted not to disclose their political affiliation. Fifteen percent indicated they were second generation immigrants (i.e., their parent(s) were born outside of the U.S., but they were born in the U.S.). Further, 36% of the sample indicated they are currently religious.

Table 4: Retailer Respondent Demographic Summary Statistics

Category	Percent
Gender (n = 33)	
Male	79%
Female	21%
Education Level (n = 32)	
High School	3%
Some College	13%
2-Year Degree (Associates)	28%
4-Year Degree (Bachelor's)	25%
Master's Degree	22%
Professional Degree	9%
Race (n = 36)	
White	66%
Black	0%
Native American or Alaskan Native	5%
Native Hawaiian or Pacific Islander	2%
Asian	10%
Other	2%
Prefer not to disclose	2%
Hispanic (n = 33)	
No	97%
Yes	3%
Political Party (n = 33)	
Democrat	6%
Republican	27%
Independent	36%
Other	6%
Prefer not to disclose	24%
1st or 2nd Generation Immigrant (n = 33)	
No	82%
Yes	15%
Prefer not to disclose	3%
Currently Religious (n = 33)	
Yes	36%
No	48%
Prefer not to disclose	15%
Previously Religious (n = 12)	
Yes	58%
No	42%

5.2.2 Retail Store Characteristics

Summary statistics of the retail stores in our sample are given in Table 5. Respondents consisted of grocery stores (78%), butcher shops or delis (14%), and "other" (8%) retail stores – likely ethnic grocery store-restaurant hybrids, which are common in areas with high ethnic populations. Most retailers represented in the sample were very small or small independent retailers, with an average of 45 employees. This is not surprising, as we sampled mainly from the National Grocers Association membership list. Further, approximately 33% of retail grocery stores in the U.S. are small or very small independent retailers, per the National Grocers Association. On average, these stores have been open for 44 years. Over half of respondents indicated their store is in a rural area.

Respondents were asked if they currently or had ever sold halal meat or poultry products: 22% responded they were currently selling halal meat or poultry products, 10% had previously sold halal meat or poultry products, 51% had never sold halal meat or poultry products at their store, and 17% were unsure if they had ever sold halal. For the purposes of the survey and this analysis, those who were unsure if they had ever sold halal were classified as "never sold halal" for further questions about their operations.

Table 5: Retail Store Summary Statistics (n = 41)

Participant Type	Frequency		Percentage
Grocery Store	33		80%
Butcher Shop/Deli	5		12%
Other	3		7%
Rural	20		61%
Suburban	11		33%
Urban	2		6%
Currently selling halal	9		22%
Previously sold halal	4		10%
Never sold halal	21		51%
Unsure if ever sold halal	7		17%
Number of Employees	**Mean**	**Min**	**Min**
	45	1	600
Year Established	**Mean**	**Min**	**Max**
	1979	1867	2021

Retail food stores sell multiple species of meat or poultry; this information is presented in Table 6. Of the 41 stores in our sample, 100% indicated they sold beef, 41% veal, 56% lamb, 85% pork, 95% turkey, 100% chicken, 17% goat, and 34% exotics (game, specialty poultry, etc.). For the 13 stores that currently sell or previously sold halal meat or poultry products, 62% sold halal beef, 38% halal veal, 46% halal lamb, 38% halal turkey, 92% halal chicken, 54% halal goat, and 8% halal exotics.

Table 6: Percent of Retail Stores that Carry Different Species of Meat and Poultry

Type of Animal	All Stores, n = 41	Current and Past Halal Stores Only, n = 13
Beef	100%	62%
Veal	41%	38%
Lamb	56%	46%
Pork	85%	0%
Turkey	95%	38%
Chicken	100%	92%
Goat	17%	54%
Exotics	34%	8%

The summary statistics for the nine current halal retailers are given in Table 7. Most of these stores sell zabiha (hand-slaughtered) halal products. Further, all stores in the sample had sold

halal meat and poultry products for less than a decade at the time of the survey. Most of these stores are certified by a third-party halal certification group. However, halal meat and poultry sales make up less than 50% of each store's overall meat and poultry sales.

Table 7: Current Halal Retailer Summary Statistics (n=9)

Category	Frequency	Percent
Zabiha	7	70%
Machine	1	10%
Unsure/don't know	2	20%
Years Selling Halal Meat & Poultry		
< 1 year	2	22%
1-3 years	1	11%
4-6 years	3	33%
6-10 years	3	33%
11-20 years	0	0%
> 20 years	0	0%
Store is Halal Certified		
Yes	5	56%
No	2	22%
Unsure	2	22%
Percent of Meat & Poultry Sales that are Halal		
< 10%	1	11%
11-25%	2	22%
26-50%	6	67%
50-75%	0	0%
> 75%	0	0%

6. Results & Discussion

The results of the analyses presented in this paper shed light on potential avenues to increase the availability of halal meat and poultry products. In the following subsections, results are given by analysis method – Likert scales, PCA, and k-means clustering - and related discussion is included.

6.1 Processors' and Retailers' Perceptions of Motivations and Barriers

Likert scales were used to assess processors' and retailers' perceptions of motivations (incentives) and barriers (disincentives) in the decision to establish a halal program at their operation. I am interested in the differences between businesses who currently or have never offered halal meat or poultry products, as these differences may indicate avenues for supporting increased market entry into the halal processing and retailing industry. Note, I do not report specific statistics for past halal processors and retailers out of this analysis, as this group includes only eight businesses.

6.1.1 Likert Scales: Motivations and Incentives

Retailers and processors were asked to indicate which motivations or incentives they considered for currently or potentially selling or processing halal meat or poultry products. An example of these questions for retailers and processors are included above in Figure 1 and Figure 2, respectively. In answering these questions, participants selected how likely each option was or would be an incentive or motivation for adding a halal program to their operations.

The results of these groups of Likert questions are in Table 8, reported as percentages. Results are presented by type of establishment – retailers and processors, halal and non-halal – and by level of incentive in decision-making.

Table 8: Results of Likert Scale Questions for Halal Incentives

Incentives Considered for Halal	Likert Scale Response	Halal Retailers n = 9	Non-Halal Retailers n = 26	All Retailers n = 39	Halal Processors n = 18	Non-Halal Processors n = 57	All Processors n = 79
Higher Price	Likely	0%	31%	20%	26%	19%	21%
	Neutral	33%	38%	37%	37%	32%	34%
	Unlikely	67%	31%	39%	37%	49%	45%
Access New Markets	Likely	67%	42%	49%	78%	28%	40%
	Neutral	11%	31%	22%	17%	25%	24%
	Unlikely	22%	27%	24%	6%	47%	35%
Supply Minority Communities	Likely	0%	19%	15%	56%	16%	25%
	Neutral	89%	54%	59%	28%	37%	36%
	Unlikely	11%	27%	22%	17%	47%	38%
Financial Aid to Establish	Likely	N/A	N/A	N/A	11%	30%	25%
	Neutral	N/A	N/A	N/A	11%	25%	23%
	Unlikely	N/A	N/A	N/A	78%	46%	51%
Assistance from Organizations	Likely	33%	23%	27%	17%	30%	26%
	Neutral	22%	31%	27%	22%	28%	28%
	Unlikely	44%	46%	41%	61%	42%	45%
Compete with Similar Businesses	Likely	56%	8%	17%	N/A	N/A	N/A
	Neutral	11%	50%	41%	N/A	N/A	N/A
	Unlikely	33%	42%	37%	N/A	N/A	N/A

Nine retailers and 18 processors reported that they are currently supplying halal meat or poultry products and answered the Likert scale questions in the survey. When making the decision to offer halal meat or poultry products at their business, the ability to sell halal products at a higher price than conventional products was not an incentive for current halal retailers and processors. However, the ability to access new markets was a strong incentive for both retailers and processors. Surprisingly, the ability to supply minority communities was not an incentive for halal retailers, with most current halal retailers indicating it was a neutral factor in their decision. This may be due to current halal retailers operating in areas of the country in which there are large Muslim populations, in which these retailers may not see Muslims as a minority in their area. Indeed, according to the Public Religion Research Institute (2023), Muslim-Americans are mainly concentrated in major metropolitan areas. However, the ability to supply products for minority communities was generally a strong incentive for current halal processors. Obtaining assistance from outside organizations to set up a halal program at their stores was in general a slight incentive for current halal retailers, and obtaining financial aid and assistance setting up a halal program were not incentives that were valued by current halal processors. Finally, the ability to compete with similar businesses was generally a strong incentive for current halal retailers and a slight incentive for halal processors.

For the 26 retailers and 57 processors that have never had a halal program, I asked which of these six factors would incentivize them to add a halal program. The majority indicated that all six factors would not be an incentive or would be a neutral factor in their decision. Access to new markets (42%) was the factor most likely to incentivize retailers to add a halal program to their store – determined by the overall percentage of the time retailers selected the factor as likely was. This is unsurprising, as it is likely that retailers that have never sold halal products are not members

of the Muslim community; most retailer respondents in our survey who said they are religious indicated they were not Muslim. Therefore, they are unlikely to have considered adding halal products to their stores and may not have known what halal was prior to receiving this survey. Indeed, several survey respondents indicated in the comments box they did not know what halal was prior to taking the survey. The factors most likely to incentivize processors to add a halal program to their establishment were financial aid to establish a halal program (30%), assistance from organizations to set up a halal program (30%), and the ability to access new markets (28%), though these are not practically significant figures.

6.1.2 Likert Scales: Barriers and Disincentives

Participants were also asked to indicate which potential barriers or disincentives they faced or considered for currently or potentially offering halal meat or poultry products at their operations. An example of this question for retailers is given above in Figure 3 and an example of this question for processors is given in Figure 4. When answering these questions, participants could select how likely each option was or would be a barrier in their decision to supply or not supply halal meat or poultry products.

The descriptive statistics of these responses are given in Table 9, reported as percentages. Results are presented by type of establishment – retailers and processors, halal and non-halal – and by level of disincentive in decision-making.

Table 9: Results of Likert Scale Questions for Halal Disincentives

Barriers Considered for Halal	Likert Scale Response	Current Halal Retailers n = 9	Non-Halal Retailers n = 26	All Retailers n = 39	Current Halal Processors n = 19	Non-Halal Processors n = 57	All Processors n = 77
Costs to Participate	Unlikely	44%	21%	26%	56%	19%	26%
	Neutral	33%	25%	26%	31%	33%	31%
	Likely	22%	46%	38%	13%	47%	43%
Discrimination from Regulators	Unlikely	67%	46%	49%	72%	53%	56%
	Neutral	33%	39%	36%	22%	44%	41%
	Likely	0%	7%	5%	6%	4%	4%
Backlash from Non-Muslims	Unlikely	100%	54%	62%	72%	56%	59%
	Neutral	0%	32%	23%	22%	39%	35%
	Likely	0%	7%	5%	6%	5%	5%
Lack of Muslim Labor	Unlikely	N/A	N/A	N/A	11%	25%	20%
	Neutral	N/A	N/A	N/A	50%	35%	39%
	Likely	N/A	N/A	N/A	39%	40%	41%
Limited Local Market	Unlikely	44%	7%	15%	68%	23%	34%
	Neutral	11%	7%	8%	5%	30%	25%
	Likely	44%	79%	67%	26%	47%	41%
Lack of Halal Knowledge	Unlikely	56%	21%	28%	72%	21%	32%
	Neutral	44%	36%	36%	6%	39%	33%
	Likely	0%	36%	26%	22%	40%	35%

For the nine halal retailers and 19 halal processors in our sample, costs to participate in a halal certification program to sell products at their businesses were not a major barrier for retailers nor processors. Evidence from interviews conducted in the first phase of this project indicated that multiple halal processors have experienced discriminatory or hostile behavior from USDA meat and poultry plant inspectors. However, the results of the national online survey show that many current halal retailers, processors, and regulators did not consider discrimination from regulators or inspectors to be a barrier to halal production.

Halal retailers and processors were not concerned about backlash from their non-Muslim customers. However, while some halal processors slaughter exclusively halal, some of the meat and poultry processing plants interviewed for this project that have a halal program said that they run halal on their processing lines relatively infrequently – from once or twice a month to once every few months – while the rest of their processing is for non-halal customers. Lack of Muslim labor was a concern for some halal processors. In interviews, some processors said they must contract with their certifier to bring in a Muslim slaughter person for the days they run halal on their line and cited reasons related to their local area (e.g., rural non-Muslim communities). For current halal retailers, a limited local market was equally indicated to be a barrier and not a barrier. Contrastingly, a limited local market was not a barrier for processors; this is not surprising, as meat processors typically distribute their products outside of their local market, regardless of whether they are halal or not. Finally, a lack of halal knowledge was not a challenge faced by current halal retailers when establishing the program at their store – again, likely because many of these retailers are themselves Muslim. However, a lack of halal knowledge was a challenge faced by 22% of halal processors when establishing the program at their establishment – this may be because of the

numerous and rigorous standards that must be upheld for halal slaughter. It may also be because many of these processors run halal infrequently and are likely not themselves Muslim.

The 26 retailers and 57 processors who have never offered halal meat or poultry products at their businesses in general differ from halal retailers and processors in what challenges they perceive they would face if they were to offer halal meat or poultry products at their establishments in the future. These retailers and processors perceive that the costs to participate in a halal certified program would be prohibitive. Discrimination from regulators and backlash from non-Muslim consumers are not seen as major challenges for retailers nor processors. Retailers' and processors' lack of concern about discrimination and backlash is likely because these businesses are, in general, not themselves ethnic or religious minorities, and therefore are unlikely to be worried about this behavior. Non-halal retailers are strongly concerned about the lack of a local market for halal meat and poultry products, as 79% of them indicated this would be a barrier for their store to offer halal, while processors are not as concerned about the lack of a local market. This makes sense, as meat and poultry products are commonly shipped across state lines from processors to retail stores, while retailers rely on customers near their stores. Finally, non-halal retailers and processors indicated that a lack of knowledge about halal meat and poultry would be a disincentive or a neutral factor in their decision to offer halal meat or poultry products in the future.

6.2 Principal Components Analysis and K-Means Clustering

PCA was conducted on the combined processors' and retailers' data sets, again excluding past halal retailers. This allows us to analyze patterns across all halal and non-halal businesses together and potentially reveal commonalities that point to outreach methods or policy design to facilitate halal market expansion. Additionally, PCA facilitates analysis of how participants

responded to all questions, instead of looking at each question's response individually. This allows me to better pinpoint participants' overall attitudes and opinions towards halal business decisions.

In the data, an increasing Likert scale value for a motivation (incentive) indicates an increase in the attractiveness of that motivation; that is, higher values correspond to a business feeling more incentivized. Contrastingly, an increasing Likert scale value for a barrier (disincentive) indicates an increase in how prohibitive it is; that is, higher values correspond to a business feeling more disincentivized. Only the Likert scale questions that were included on both the retailer and the processor surveys were used for the PCA.

The results of PCA for this analysis are given in Table 10 and Table 11. A PC was retained if it accounted for at least 10% of the variation in the data. The PCA resulted in three latent factors representing a total of 71.84% of the variance in the original dataset; PC1 represented 37.29% of the variation, PC2 represented 22.35%, and PC3 represented 12.20%. Thus, there are now three new variables (PC1, PC2, and PC3) that contain information and patterns between the nine variables in the original dataset (the motivations and barriers). These three new variables now facilitate more straightforward analysis of the responses, as they represent the three major trends or themes in the data in which we can classify behavior. I call these new variables "Concerns" (PC1), "Motivators" (PC2), and "Niche Minority Considerations" (PC3) and explain their elements below.

PC1, "Concerns," has positive correlations of approximately equal magnitude with all the features of a business' decision of whether to offer halal products; thus, businesses with high values of PC1 are equally motivated by the incentives and dissuaded by the barriers. PC2, "Motivators," has a positive correlation with all motivations and a negative correlation with all barriers; thus, businesses with high values for PC2 consider the motivations to be attractive and the barriers to

not be prohibitive in their decision-making process. PC3, "Niche Minority Considerations," has a positive correlation with the first three motivations: Price Premium, Access to New Markets, and Providing a Religious Minority Product, as well as two of the barriers: Discrimination from Regulating Bodies and Backlash from Non-Muslim Customers. It follows that businesses with high values of PC3 have mixed opinions on the motivations and barriers, specifically those related to supplying religious minority products when deciding to offer halal at their business.

Table 10: Eigenvalues and Proportion of Variance for Principal Components Analysis of Retailer and Processor Data, n = 109

Principal Components Metrics	PC1	PC2	PC3
Eigenvalues	3.36	2.01	1.10
Proportion of Variance	37.29%	22.35%	12.20%

Table 11: Loadings for Principal Components Analysis of Retailer and Processor Data, n = 109

Motivation or Barrier	Motivation or Barrier	PC1	PC2	PC3
Motivation	Price Premium	0.38	0.26	0.04
Motivation	Access to New Markets	0.28	0.47	0.13
Motivation	Providing a Religious Minority Product	0.21	0.47	0.32
Motivation	Technical Assistance Setting Up	0.36	0.29	-0.12
Barrier	Halal Certification Program Costs	0.37	-0.17	-0.40
Barrier	Discrimination from Regulating Bodies	0.31	-0.36	0.49
Barrier	Backlash from Non-Muslim Customers	0.28	-0.40	0.50
Barrier	Limited Local Market Opportunities	0.34	-0.22	-0.40
Barrier	Lack of Halal Knowledge	0.41	-0.18	-0.21

K-means clustering was then conducted using the three PCs from the PCA as the underlying factors on which to sort the respondents. Three groups ($k = 3$) were chosen due to the small number of responses, as conducting k-means with more groups in each data set resulted in at least one group with very small membership relative to the other groups.

Table 12 gives the group sizes and their mean PC values. Group 1 had 35 members, with the most negative average values for PC1 "Concerns" (-1.82), PC2 "Motivators" (-1.03), and PC3

"Niche Minority Considerations" (-0.23) of the three groups, though the magnitude of the PC3 averages is small. The negative values of all three PCs combined suggest that the motivations are strongly negatively weighted for Group 1, while the weight placed on the barriers is close to zero in magnitude. Group 1 is therefore least likely to find the motivations for offering halal meat and poultry products to be attractive and are neutral towards the barriers to offering halal. When comparing their opinions to the operational and demographic data (Table 13), the findings are logical; these are the smallest businesses on average and contain a large percentage of rural businesses, as well as a large percentage of non-halal businesses and a small percentage of halal businesses. Taken together, it is possible that these smaller, more rural businesses do not have the local market to sell halal products to or may not have the capacity to add another program to their establishment. As such, I would not expect these businesses to be strong candidates for adding a halal program to their operation in the future.

Group 2 had 28 members, with the most positive average value (1.56) for PC2 "Motivators" of the three groups. The average values for Group 2's PC1 "Concerns" (-0.42) and PC3 "Niche Minority Considerations" (0.07) are the mid-range value relative to Groups 2 and 3, though PC3 is relatively small in magnitude (Table 12). Thus, Group 2 was most strongly positively influenced by the motivations and negatively influenced by the barriers in PC2. However, Group 2's PC1 magnitude indicates a slight counteracting negative influence to PC2. Therefore, Group 2 contains businesses that are most likely to find motivations for offering halal to be attractive and the barriers to be prohibitive. The conflicting negative and positive influence of PC2 and PC1 indicate the barriers are overall more prohibitive in Group 2's decision-making than the motivations are attractive. Group 2 contains the highest percentage of retailers, the highest percentage of halal businesses, the lowest percentage of non-halal businesses, are the largest on

average, the most recently established, and are more likely to be in urban or suburban areas than the other two groups (Table 13). Since Group 2 has the highest percentage of halal businesses, it is likely that businesses in this group that do not currently offer halal products are good candidates to do so in the future, as they must have other qualities in common that align with halal market participation. Indeed, these businesses are more likely to be in areas with larger Muslim consumer populations and may have the capacity to add an additional program to their operation. Additionally, retailing of halal products requires much less capital investment and knowledge of the halal slaughter process than what is required for slaughterhouses and processors, and therefore may allow these businesses to adopt halal more easily. However, as these businesses are slightly younger on average, they may not have the capital to support expanding into a new market, which may explain their larger concerns with the barriers to market entry. Additionally, it is worth noting that Group 2 is the smallest group, with only 13 non-halal businesses, meaning the proportion of businesses that are good candidates to adopt a halal program in the future is small relative to the overall sample of this study.

Group 3 had 46 members, with the most positive values for PC1 "Concerns" (1.64), and mid-range values for PC2 "Motivators" (-0.17) and PC3 "Niche Minority Considerations" (0.13) that are relatively small in magnitude. Thus, Group 3 was most strongly influenced by PC1, with slight counteracting effects from PC2 and PC3. Group 3 therefore contains businesses that are likely to find the motivations for halal to be attractive and the barriers to be prohibitive, with the influence of the motivations and barriers fairly equal and opposite each other relative to Group 2. Group 3's businesses are on average the oldest of the three groups, have the highest percentage of processors, and a relatively high percentage of retailers. Retailing and processing halal products is logistically simpler than slaughtering, which would make adoption of a halal program more

straightforward for these businesses than groups with more slaughterhouses. Additionally, older businesses are likely well-established and could have more access to capital resources to expand their operations. Thus, these businesses may be good candidates for expanding into the halal meat and poultry business in the future if given enough information on the motivations and barriers specific to their operations (e.g., a feasibility study).

Table 13 gives operation and respondent demographic percentages across the three groups of businesses. Note that not all percentages sum to 100% within a group's category (e.g., race), as some respondents declined to answer all survey questions. From the F-tests and resulting t-tests, I find that there exist significant differences for non-halal, current halal, only processors, number of employees, at most high school diploma holders, and Asians. There are statistically significant differences at the 1% level between Groups 1 and 2 for the percentages of non-halal and current halal businesses, and a difference at the 5% level for the number of employees. There also exists a statistically significant difference between Groups 1 and 3 at the 5% level for high school diploma holders. Finally, there exists a statistically significant difference between Groups 2 and 3 at the 1% for halal and non-halal businesses, and at the 5% level for number of employees, Asian respondents, and high school diploma holders. Altogether, I see the most distinct operational demographic patterns between Groups 1 and 3 versus Group 2.

Table 12: K-Means Groups and Means of PC1, PC2, and PC3, Retailers and Processors, n = 109

Group	Number of Members	Mean of PC1	Mean of PC2	Mean of PC3
1	35	-1.82	-1.03	-0.23
2	28	-0.42	1.56	0.07
3	46	1.64	-0.17	0.13

Table 13: Demographic Composition of Groups, n = 109

Demographics	Group 1 (n = 35)	Group 2 (n = 28)	Group 3 (n = 46)
Operation Demographics			
Non-Halal Businesses	85.71%[a***]	46.43%[a***, c***]	86.96%[c***]
Current Halal Businesses	14.29%[a***]	53.57%[a***, c***]	13.04%[c***]
Slaughter and Process	34.29%	32.14%	21.74%
Only Slaughter	5.71%	7.14%	2.17%
Only Process	28.57%	21.43%	36.96%
Retailer	25.71%	35.71%	34.78%
Year Established	1991	1993	1986
Number of Employees	28[a**]	63[a**, c**]	32[c**]
Rural	51.43%	39.29%	52.17%
Suburban	20.00%	32.14%	23.91%
Urban	8.57%	17.86%	8.70%
Respondent Demographics			
White	62.86%	75.00%	78.26%
Black	0.00%	3.57%	0.00%
Asian	5.71%	10.71%[c**]	0.00%[c**]
Native American or Alaskan Native	2.86%	0.00%	2.17%
Hispanic	0.00%	3.57%	4.35%
Democrat	5.71%	10.71%	4.35%
Republican	25.71%	28.57%	32.61%
Independent	22.86%	32.14%	28.26%
First or Second-Generation Immigrant	5.71%	10.71%	4.35%
Female	20.00%	10.71%	23.91%
High School	11.43%[b**]	10.71%[c**]	0.00%[b**, c**]
Bachelor's	25.71%	35.71%	32.61%
Graduate Degree	17.14%	14.29%	21.74%
Religious	54.29%	42.86%	50.00%

Notes: F-tests conducted on all three groups and statistically significant findings evaluated with pairwise t-tests. Statistical significance between groups from the pairwise t-tests is indicated as follows: [a] indicates significance between Groups 1 and 2, [b] indicates significance between Groups 1 and 3, and [c] indicates significance between Groups 2 and 3. Additionally, *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

7. Conclusions, Limitations, and Future Work

This study utilized a mixed methods approach consisting of qualitative interviews and nationwide online surveys with U.S. meat and poultry processors and retailers. The purpose of this research was to investigate the decision-making process for offering halal meat and poultry

products; specifically, the incentives and barriers that exist when entering the halal meat market and how retailers and processors perceive them. The goal of this research was to determine characteristics of businesses that are mostly likely to adopt a halal program in the future and how to facilitate their market participation. Both halal and non-halal businesses were sorted into three groups via principal components analysis (PCA) and non-hierarchical k-means clustering using the data collected on the motivations and barriers related to offering [certified] halal meat and poultry products.

Altogether, my analysis sheds light on potential avenues for supply-side expansion of the U.S. domestic halal meat and poultry industry. By studying patterns in businesses' perceptions of the motivations and barriers and operational demographics, I can determine common characteristics that lend themselves well to the adoption of a halal program. Indeed, the analysis shows that urban, suburban, retail, younger, and larger businesses are more likely to currently have a halal program (Group 2), while businesses that may expand into the halal market in the future are older and more likely to be retailers or processors instead of slaughterhouses. As retailing and processing of halal meat and poultry products is generally less capital intensive and requires less knowledge and skill to implement, these businesses are likely the strongest candidates to expand into halal in the future. Furthermore, if this expansion in the downstream supply chain can be achieved, it may make adding a halal program upstream to existing slaughtering facilities more attractive and provide demand-driven pressure for halal slaughterhouse market entry.

There are a few notable limitations of this study. First, collecting data from supply-side agents in any market is notoriously difficult, which leads to lower response rates and lower numbers of quality observations in our dataset. Thus, more complex statistical analyses were not possible. Second, there are relatively few halal meat and poultry businesses in the U.S. compared

to traditional meat and poultry businesses, so halal businesses are not equally represented in our survey sampling. Finally, even though efforts were made to survey participants in their native language, it is likely that some halal businesses did not take the survey due to English language barriers.

There is still need for more research focused on the U.S. domestic halal meat supply chain, and future studies can expand on this work in a few ways. As my analysis was exploratory in nature, additional research can and should be done into the noteworthy motivations and barriers for the different types of businesses in this study – halal retailers, halal processors, non-halal retailers, and non-halal processors. A deeper understanding of these businesses' differences in perceptions of adopting a halal program would help design more effective policies and incentive structures for a more robust halal meat supply chain. To achieve this, future work would benefit from larger sample sizes to facilitate more advanced statistical techniques for data analysis. There are two methods that I believe could be effective for increasing sample size when working with these populations. First, utilizing a team of researchers to conduct in-person or virtual (e.g., Zoom or phone) surveys in real-time may increase response rates and quality, as processors and retailers are typically less likely to complete surveys. Secondly, some of the U.S. Muslim community are nonnative English speakers, especially older individuals and recent immigrants. As such, researchers may benefit from close partnerships with native Arabic and Urdu speakers when collecting data from halal businesses to increase participation rates. Altogether, these suggestions will help future work make meaningful contributions to our understanding and support of this unique market, as well as add to the literature on meat and poultry businesses' decision making and design of policy to support supply chain development.

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CHAPTER 2. MARKET PARTICIPANTS' PREFERENCES FOR A NATIONAL HALAL MEAT CERTIFICATION PROGRAM

1. Introduction and Motivation

There are over 200 different halal food certification organizations around the globe (Zabihah 2021, Verify Halal 2022), and in the U.S. alone, there are over 20 verified halal certification organizations. Given that the global Muslim population does not have a universally accepted and verified halal meat standard and the resulting astoundingly large number of certifications and certifying organizations operating in the market, it is unsurprising that halal foods are the fourth most likely food in the U.S. to be fraudulent (FSNS 2020). In most cases, halal meat and poultry certification organizations have their own internal halal standards that they use to evaluate and then grant certification; these depend on how strictly they interpret the religious laws from *The Qur'an* and the teachings of the Prophet Muhammad (peace be upon him) written in *The Hadith* that govern halal meat. The plethora of distinct and sometimes contradictory certifications can make selecting a product confusing for consumers, accurately sharing information with customers difficult for retailers, and determining requirements for halal meat processing challenging for processors.

There is an overabundance and a lack of clarity and standardization in certifications in the U.S. halal meat and poultry market. The current halal meat and poultry market situation is similar to the U.S. organic market prior to the development of the USDA organic certification, when there were many different and competing organic certifications available for producers, and consumers necessarily incurred search and information collection costs to determine which labels and standards were on products (Lohr 1998). As in the case of the pre-USDA certification organic market, this likely makes it challenging for participants to engage fully in the halal meat and poultry market and reduces the domestic market's competitiveness relative to imported products

(Lohr 1998). Further, an overabundance of certification and regulations serves as a barrier to market entry for specialty meat products (Worosz et. al 2008) – especially in the case of smaller or new operations, as previously seen in the organic farming industry (Guthman 1998). These barriers result in a loss of market efficiency, and in the long term, a harm to consumers who are thereby underserved. Thus, this research aims to undertake the first step in the process of developing a U.S. NHMC program to help streamline market participation.

These shared concerns suggest there is room for a verification strategy in the form of a unified U.S. national halal meat and poultry certification (NHMC) program. Correspondingly, the purpose of this study is to understand what the U.S. domestic halal market participants want out of a NHMC program, and how these desires compare to what is feasible to implement. Therefore, to determine what such a program would look like and how it would operate, this chapter addresses three major research questions. First, what characteristics of a hypothetical NHMC are important to halal meat processors, halal meat retailers, and Muslim halal meat consumers? Second, are there differences in preferences for NHMC program characteristics between groups, and if so, what is the nature of these differences? And finally, how could differences in preferences between groups impact the design and implementation of a NHMC program? This research will answer these questions by investigating the preferences for a NHMC program at three levels of the market (processors, retailers, and Muslim halal meat consumers). The differences in preferences across groups will be compared to each other and will serve as a baseline understanding of the market's desires, which future research can expand upon.

In all, this research contributes to the literature on labeling and certification for improving trust in products with credence attributes. This chapter provides an overview of the variety of different halal meat certifications, certification programs, and certifying bodies around the world,

with a direct comparison to the current U.S. halal meat certification landscape, which to the author's knowledge has not been explicitly explored before. Altogether, the findings of this chapter will aid in bolstering halal meat consumer confidence in the authenticity of their products, as well as improve the equity of the U.S. food system.

2. Current Landscape of U.S. Domestic Halal Certifications

As early as the 1970s and 1980s, U.S. Muslim consumers – concerned about the authenticity of the halal meat and poultry products they were buying – began to demand more verification for their products in the form of third-party labels and certifications. From this movement, certifying organizations were established; these organizations typically charge a fee – per unit, an annual lump sum, or some formulaic combination – to inspect slaughter, processing, and retail facilities and provide certification that their products and/or establishment conforms to a given set of halal standards.

As the demand for halal meat and poultry products has grown and evolved over the past 50 years, so too has the number of certifiers, the variety of certifications, and the ways in which certifiers operate. Today, there are several major halal meat and poultry certifiers and another dozen or so smaller local or regional certification agencies operating in the U.S.[5] These certifiers are broken into two organizational categories: non-profit foundations that rely mainly on volunteer work and donations from the public to operate, and for-profit businesses which charge fees for their services and retain employees to conduct the certification process.[6] The non-profit foundations include Halal Monitoring Services (HMS) of Shariah Board of America and Halal Food Standards Alliance of America (HFSAA), among others. The for-profit businesses include

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[5] Not all of these certifiers work exclusively with meat and poultry products.
[6] These classifications are based upon what the author learned in qualitative interviews with halal meat and poultry certifiers during this project and are not necessarily mutually exclusive nor immutable.

Islamic Services of America (ISA), Islamic Society of the Washington Area (ISWA), Halal Transactions of Omaha (HTO), Islamic Food and Nutrition Council of America (IFANCA), and American Halal Foundation (AHF), among others.

Many of the for-profit certifiers have certification via the United States Department of Agriculture's Food Safety and Inspection Service (USDA-FSIS) to operate in the import and export markets, while the non-profit foundations generally do not.[7] For-profit certifiers offer both zabiha and machine-slaughtered halal certifications, while the non-profit certifiers focus mainly on the zabiha market.[8] Correspondingly, for-profit certifiers typically contract with larger domestic and multinational corporations and establishments looking for international business opportunities, while non-profits operate mainly in the domestic small and local business arena. Thus, for-profit certifiers currently make up most of the certification market by both quantity of products certified and revenues received, therefore holding the majority of power in the halal certification market. However, the non-profit certifiers work with a larger number of domestic businesses, though the quantity of products and overall revenues is lower.

As with any market, power dynamics and market structure play a pivotal role in market growth, policy development, and the implementation of new methods of production.[9] Indeed, the U.S. domestic halal meat and poultry certification market is no exception. According to multiple certifiers and Muslim consumer advocacy groups, efforts have been underway for over a decade to create a set of industry-wide U.S. national halal standards, though progress in reaching agreements on what specifications and requirements to include has been slow. For-profit and non-

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[7] These certifications are a service provided by the Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA) and requires businesses to pay a fee to obtain export certification and/or import products from foreign countries.

[8] The term "zabiha" refers to hand-slaughtered animal products. More information is given in the preface to this dissertation.

[9] Historically, markets with an imbalance of power (e.g., those with monopolies or oligopolies) see declines in growth, equity, innovation, and efficiency losses (Washington Center for Equitable Growth 2018).

profit certifiers commonly disagree on which standards should be included in a U.S. national halal certification, as well as how such a certification should be implemented and verified. What's more, Muslim halal consumers have varying opinions due to the extremely diverse nature of the population in terms of ethnicity, religious sect, immigration and citizenship status, and other cultural factors. The dissenting views on halal certification from both the supply and demand side of the market contribute to the ongoing struggle to develop a single cohesive certification program.

Further complicating the matter are the views of the general public and federal and state government representatives. Islam is a minority religion in the U.S., and multiple domestic and international events over the past several decades have reinforced prejudices that negatively impact U.S. Muslims; indeed, a Pew Research poll revealed that a significant percentage of Americans believe Muslims face "a lot of" discrimination and are viewed more negatively than other religions (Mohammed 2021). As such, it is unlikely that many government representatives will move to make changes to state or federal laws to improve halal verification and transparency, nor support the development of a national-level halal meat and poultry certification. Instead, general efforts to increase authenticity in the food system, strengthen traceability, and improve labeling requirements are more realistic avenues for addressing halal certification issues.

2.1 Legal Enforcement of Certifications in the U.S.

In the U.S., there are a lack of labeling regulations in place to ensure that consumers know which standards are involved in the production of food products. Outside of a handful of states that have instituted forms of consumer-right-to-know legislation (California, Illinois, Maryland, Michigan, Minnesota, New Jersey, New York, Texas, and Virginia), there is no federal law or regulation that requires a business that claims to be certified to supply a given specialty product to prove that they are certified by displaying the certificate or registering with the state department

of agriculture. Furthermore, these state laws that require proof of certification to be readily available often are not enforced. Altogether, there is ample room for fraudulent behavior by uncertified actors throughout the U.S.; this is likely a large factor contributing to halal food being the fourth most fraudulent industry in the U.S.

When looking to certify an attribute, one of the main questions is who should be the certifying body. Many studies have focused on preferences for certification entities and have found that government certification is in general more trusted than third-party certification in a wide variety of contexts; see for example McKendree et al. (2013), Johnston et al. (2001), Ortega et al. (2011, 2012), and Sønderskov & Daugbjerg (2011). However, for the halal market in the U.S., the First Amendment prohibits the government from setting any religious product standards, as this would be an infringement of religious freedoms. California, Illinois, Maryland, Michigan, Minnesota, New Jersey, New York, Texas, and Virginia have all circumvented these constitutional rights concerns by enacting laws in the spirit of consumer-right-to-know considerations. These include allowing the state to enforce the proper use of halal labels, including outlawing mislabeling and false representation, requiring businesses to display their halal meat Department of Agriculture registration, and requiring separate facilities/machinery for halal products to ensure no cross contamination can occur (Illinois Halal Food Act 2002). A similar law exists in many states for kosher meat. A federal law and enforcement akin to these states' laws would provide another layer of authentication to prevent halal food fraud.

3. Halal Certification Around the World

Of the plethora of certification programs operating around the world, there are several that oversee halal production standards on a national or even multi-national scope – such as the Department of Islamic Development Malaysia (JAKIM) program or the Australian national halal

meat program (Rhaman et al. 2018, Australian Halal 2022). Though the U.S. does not have the same institutional framework as these countries, lessons can be learned from national-level programs already in place.

In countries like Australia, Singapore, the United Arab Emirates (UAE), and Malaysia, the national halal meat certification (NHMC) standard is set by, and administered through, the federal government. This allows for a generalization of the halal meat standards within these countries; there is only one halal meat standard or a set of predetermined levels of halal meat standards. This makes adoption by supply-side agents in the halal meat market straightforward, as they can either adhere to the universal standard or not – there is no room for interpretation or for confusion as to which certification a supplier needs to enter the market. This is also advantageous for consumers, as the halal meat standards will be identical across the country, so there is no room for miscommunication or confusion with competing labels or standards. On the flip side, this does remove diversity from the halal meat market, and so consumers who desire different standards for halal meat products may still need to look elsewhere for their products. While a program in which local, state, or federal government sets halal standards may not be possible in the U.S. due to concerns about First Amendment violations, the structure and development of a national program is still useful to understand. Furthermore, a U.S. national program could potentially have government involvement in the enforcing of standards set by non-governmental organizations.

In contrast, in other countries, there is no national halal program, leaving room for multiple third-party agents, such as Islamic community groups, imams (faith leaders in Islam), and certifying corporations to design their own halal meat standards and certification implementation processes. This system is akin to what is currently in place in the U.S., Canada, and most other countries across the globe. This system can be very confusing to consumers and supply-side agents

alike, especially when there is little to no transparency in the standards required to obtain a given certification. Consumers are faced with an overload of information and sorting out which certifications align with their beliefs is mentally taxing. Supply-side agents have other issues – selecting one certification to use in their operation may preclude them from some market opportunities or result in backlash from consumer groups who do not agree with the standards they follow. These concerns are especially relevant in the U.S., as, to the author's knowledge, the U.S. has the largest number of halal meat certifiers and certifications currently available in the market of any country in the world. However, this assortment of certifications can also be a boon – for consumers with very niche requirements, they may be able to find a certification that aligns with their beliefs, whereas a universal standard may not align. Altogether, the future of U.S. domestic halal certification is complex, and understanding and addressing the market's needs will require significant effort on behalf of researchers and policy makers alike.

3. Mixed Methods and Survey Design

As discussed, the U.S. domestic halal meat and poultry market has distinctive niche religious requirements that must be upheld. The nature of the halal market, coupled with the lack of research to understand the certification landscape of the U.S. halal meat market poses an exciting opportunity to focus this study on multiple groups throughout the domestic market. This ensures that the main actors in the halal meat market that would be impacted by a certification – consumers, retailers, and processors – are included in the study. This understudied market also requires a methodological approach designed for exploration and learning feedback. Therefore, I employ a mixed methods research design using both qualitative interviews and quantitative survey methods in this project. The synergy between methods is exhibited in two ways. In the first stage of this project, I conducted qualitative interviews with halal meat processors, retailers, and Muslim

consumers. These qualitative interviews were necessary to develop an understanding of and elicit opinions on halal meat market certification practices in the U.S. domestic market. I used the data from these conversations to narrow my research questions and design quantitative data collection tools. From these interviews, I determined the most appropriate questions to explore in relation to halal meat and poultry certification revolve around an overabundance of certifications, unclear standards, and a lack of transparency in certification use and enforcement. These qualitative interview findings in turn inform the quantitative components of the study. In particular, the patterns uncovered in the qualitative research indicated that the quantitative data collection should utilize best-worst scaling (BWS) to measure processors', retailers', and consumers' preferences for possible attributes of such a program.

3.1 Phase 1: Qualitative Interview Methods

The qualitative portion of this project was designed with methods from Patton (2014), Rubin and Rubin (2011), and Maxwell (2012). The purpose of these qualitative interviews was to obtain information about the U.S. domestic halal meat and poultry industry's certification standards and process previously unknown to me, as this market is understudied. Information collected via qualitative interviews included Muslim halal consumers', halal retailers', and halal processors' opinions on the current certification landscape and their preferences for future certification development. Collecting information directly from market participants in this way allowed me to design a more robust and relevant research program for the quantitative portion of this project. The qualitative interviews also provided vital context and explanatory power for the quantitative survey findings. Interview questions were grouped by topic and were open-ended to allow for robust answers (Patton 2014, Rubin and Rubin 2011, Maxwell 2012). The interview

guide for these interviews, information for how interviews were conducted, and the outline of the interview analysis process are found in Appendix A.1.

Supply-side interviewees were recruited from lists of retailers and processors registered as certified to supply halal meat by a reputable halal meat certifier. The lists of supply-side interview candidates were narrowed to those in Midwestern states for ease of access and improved likelihood of name recognition for Michigan State University. A series of eight in-depth, semi-structured interviews with Midwestern halal meat retailers and 10 in-depth, semi-structured interviews with Midwestern halal meat processors were conducted December 2021 through April 2022. Supply-side interviews were conducted via Zoom or over the phone. Consumer interviewees were recruited in person from five different certified halal meat retailers in Illinois, Wisconsin, and Michigan; the list of interested participants was then randomly sampled from. Selected consumers were interviewed over Zoom or via phone and were compensated for their participation with a $50 gift card. In total, 12 consumer interviews were conducted in April 2022 through June 2022.

3.2 Phase 2: Quantitative Survey Methods

The second stage of this chapter involves conducting three stacked national online surveys, one with a sample of meat processors, one with a sample of meat retailers, and another with Muslim halal meat consumers.[10] These parallel stacked surveys are designed to assess preferences related to the development of a hypothetical U.S. NHMC program. The surveys had three major purposes: first, to further explore the patterns uncovered in the qualitative interviews; second, to be able to gauge these groups' preferences and opinions at a national level; and third, to directly compare preferences and response patterns across the three market groups – a key advantage of stacked surveys. This method is particularly attractive for application in this study, as consumers,

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[10] Surveys were available in English, Arabic, and Urdu for all study participants.

retailers, and processors are the main actors in the halal meat market that would be impacted by a certification and should therefore be included. Additionally, the shared desire for a NHMC program across the three groups interviewed suggests that comparing preferences directly in this manner will be useful in determining consensus or differences in opinions.

To compare preferences for attributes of a U.S. NHMC program directly across the three groups using a consistent and unitless ranking system, I use best-worst scaling (BWS), also known as maximum difference (max-diff) scaling or most-least scaling. BWS is a choice analysis method that asks participants to repeatedly – over a series of different choice sets – select the most preferred (best) and least preferred (worst) options out of a given set of items and allows the researcher to thereby understand preferences between items. BWS was introduced by Finn and Louviere (1992) with theoretical properties of probabilistic, best-worst choice models being more recently explained by Marley and Louviere (2005). BWS is advantageous relative to Likert scale questions, as Likert scales make it challenging to distinguish the actual importance of attributes. For example, multiple Likert scale questions can all have the same mean level of importance. Likert scale questions are additionally problematic due to scale subjectivity – what is considered a "4" on one individual's scale may be a "5" on another (Lusk and Briggeman 2009, Lusk and Parker 2009, Wolf and Tonsor 2013). Additionally, as BWS is a tradeoff method, I achieve shares of importance that can be directly interpreted from a ratio scale. The sum of shares among all attributes analyzed must equal one. If attributes j and k have importance shares of 0.2 and 0.1, respectively, attribute j is two times as important as k. BWS also provides five to ten times more differentiation than most scaling methods, such as the aforementioned Likert scales (Horne 2012). Directly interpretable shares and more differentiation provides further insight into the exact importance of each attribute.

In each survey, participants were asked a series of seven BWS questions with different combinations of seven attributes of a potential future U.S. NHMC program. In these questions, participants were asked to select which of three attributes they thought was the most important and which was the least important to consider when designing a U.S. NHMC program. An example of one of the questions that participants saw is shown in Figure 5.

Figure 5: Example Best-Worst Question for Potential National Halal Certification

Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. *__halal__* meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	**Which group(s) will enforce the program** (e.g., government, religious organization, private non-religious organization)	○
○	**What will be required to be certified** (e.g., products, retailers, slaughter and processing establishments)	○
○	**What halal standards will be required** (e.g., hand versus machine slaughter, stunned or not stunned)	○

3.3 Attribute Selection for the Best-Worst Scaling Survey Instrument

The BWS for this survey includes seven attributes for consideration. The attributes for the BWS questions were selected based on the characteristics of current certification programs around the world (both within and outside of halal meat), discussion in the literature, and information collected from interviews. Justification for these choices is broken down by attribute below. These attributes differ slightly in their precise language across the three surveyed groups to better fit the audience; attributes included here are cost, administrative body, traceability, information collected or available, certification type, audit characteristics, and halal type. The description of these attribute categories and the relevant questions for each surveyed group are presented in Table 14.

Table 14: Best-Worst Scaling Attributes and Question Language by Group

Attribute	Referred to in paper as	Attribute wording by group		
		Consumers	Retailers	Processors
	Costs	Additional costs I would need to pay for certified products	Costs associated with certification program involvement (certification fees, infrastructure, labor)	
	Enforcement	What organization enforces the program standards		
	Benefits	Confidence gained by purchasing a certified product	Benefits associated with certification program involvement (access to new markets, price premiums, etc.)	
	Information	What information is available to me	What information is passed on to my customers	
	Who/What Certified	What or who should be required to be certified (products, retailers, slaughterhouses, etc.)		
	Inspections	How retailers and processors are audited/inspected	How my suppliers' & my operation are inspected	How my operation is inspected
	Halal Standards	What halal standards are required (hand- versus machine-slaughtered, stunning or no stunning, etc.)		

3.3.1 Costs

Cost is a major component of a certification's success and is therefore vital to include in the BWS questionnaire. Supply-side agents are unlikely to adopt a new certification, technology, or production method if they perceive the costs of adoption outweigh the benefits (Pearson & Henryks 2008, El-Osta & Morehart 2000, Ugochukwu & Phillips 2018). Likewise, consumers are unlikely to pay the price premium for a certified product if the premium elevated the cost of the product outside of their budget (Pearson & Henryks 2008). The qualitative data indicated that supply-side agents were concerned about bringing new or additional certification programs into their operations, as these are likely to raise their cost of production, which would be mostly passed onto their consumers. Similarly, consumers interviewed were also hesitant about potential increased prices on their halal meat products, which are already more expensive than non-halal products.

3.3.2 Enforcement

It is also essential to consider preferences that market participants may have for a NHMC program's administering body, as opinions on government versus non-government oversight are varied. McKendree et al. (2013), Johnston et al. (2001), Ortega et al. (2011, 2012), and Sønderskov and Daugbjerg (2011) have all found that certifications administered by a government agency are in general more trusted than those run by a third-party organization. However, in the case of halal meat, which is a religious standard, a government-run certification program would likely violate the First Amendment, and so an alternate organizer is needed. Further, halal meat processors and retailers interviewed communicated trepidation with additional government involvement in their operations. In contrast, most consumers interviewed were in favor of increased government involvement in regulating halal certified meat products.

3.3.3 Benefits

Given the rampant food fraud found in the halal market (FSNS 2020) and market agents' corresponding concerns about transparency, the benefits to consumers and supply chain agents alike of a NHMC program are necessary to consider. On the supply side, access to additional markets is possible, and consumer trust and loyalty can be improved using certifications. Wary consumers are likely to be willing to pay more for certified products to have enhanced peace of mind. Processors and retailers interviewed described interest in using a national certification to access new markets and share product attributes easily; consumers likewise would like the ability to verify product information more easily.

3.3.4 Information

Market agents have preferences for what types of information is collected throughout the supply chain. There is a fine line for some individuals between collecting relevant and necessary information for ensuring a certification is met and being overly intrusive in an operation. Some processors interviewed were concerned that collecting additional data on their day-to-day operations would slow down their processing. Others expressed displeasure with the idea of yet another agency "sticking their noses" into business.

Further, it is important to consider what, if any, of the information collected should be available for downstream agents to access. In interviews with processors and retailers, some discussed experiences with adding a halal meat program to their organization, only to be met with backlash from non-Muslim consumers. As such, some processors and retailers, especially larger non-Muslim owned operations may be hesitant to have their certification information publicly available. However, Muslim-owned processing plants and retailers, as well as the Muslim consumers interviewed, want this information to be readily available to the public. This increased

availability of information can aid in halal meat consumers' search efforts and help supply chain agents compete.

3.3.5 Who or What is Certified

Certification type refers to what the certification program applies to – in this case, whether individual halal meat products should be certified (i.e., a brand of chicken breasts), whether an entire operation should be certified (i.e., a slaughterhouse or a retailer), the entire supply chain (i.e., processors, wholesalers/distributors, and retailers), or some combination of these options. Current halal meat certification agencies in the U.S. certify at all these levels; some certify individual products or supply chain agents (e.g., Islamic Services of America 2022), and some certify the entire supply chain (e.g., Halal Monitoring Services 2022). In interviews, members of all three groups – consumers, retailers, and processors – had preferences between the types of certifications they preferred, with some insisting on full supply chain certification and others accepting piecemeal product certificates.

3.3.6 Inspections

Audit characteristics refers to the type of audit (i.e., scheduled or surprise) and how often a certification must be renewed or confirmed (i.e., yearly, monthly, daily). Some of the certifiers in the U.S. have a scheduled annual audit for renewal for their certifications (e.g., Islamic Services of America), while others have both a scheduled annual audit and surprise audits (e.g., Halal Monitoring Services). Further, in the case of meat, it is important to consider the value to the consumer in confirming that the certification has been upheld for each day a processor conducts halal slaughter. This distinction in audit type and frequency may be important to consumers who do not trust current certifications currently in the U.S.

3.3.7 Halal Standards

Last, but likely most important to Muslim halal meat consumers, is preferences for halal type, which are likely to have a strong impact on preferences for a NHMC program's attributes. There is a very long list of attributes that consumers could prefer to be certified as part of a halal standard. These include whether the animal was hand- or machine-harvested, pre-stunned before harvest, facing Mecca at the time of slaughter, harvested by a Muslim or a Person of the Book, and many other considerations. These attributes vary in their ease of implementation in industrialized food systems; hand slaughter results in a slower line speed than machine slaughter but facing Mecca may be relatively simple to accommodate. Regardless of the ease of adopting these methods, these attributes are vitally important to Muslims and non-negotiable for many. For instance, in interviews, consumers said they have never and will never eat machine-slaughtered halal meat products; that is, they require a halal meat certification that uses hand-slaughter methods. On the other hand, processors interviewed are concerned about the competitiveness of their operations when their line speed is significantly slower under hand-slaughter methods.
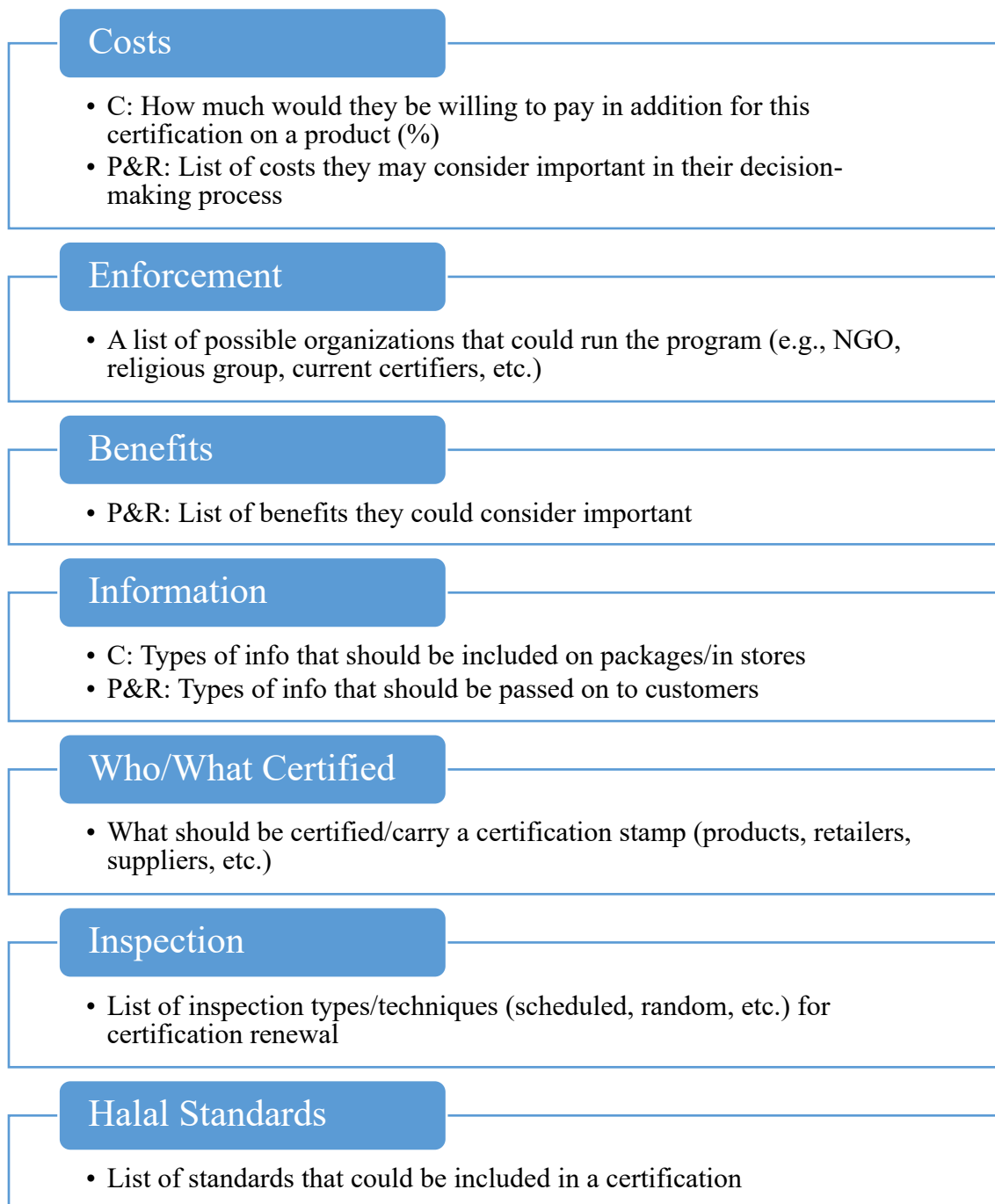
3.4 Additional Survey Questions & Analysis Methods

In addition to the BWS questionnaire, the survey included follow-up questions for each attribute category to clarify what preferences the three groups have. For example, for the attribute "Enforcement and Regulation," the follow-up question shown to participants is given in Figure 6. The full list of follow-up questions for the seven attributes are given in Figure 7. These follow-up questions elicit more specific preferences that the surveyed groups have and allow for a more detailed comparison of choices across the market groups.

Figure 6: Example Best-Worst Scaling Follow-Up Question

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Who should oversee or enforce a national halal certification program? (Select all that apply)

- ☐ U.S. Government (e.g., USDA)

- ☐ State government (e.g., state department of agriculture)

- ☐ Non-government organization

- ☐ Religious organization(s)

- ☐ Certifier led organization

- ☐ Producer led organization

- ☐ Packers/Processors

- ☐ Retailers

- ☐ Other

Figure 7: List of Follow-Up Best-Worst Scaling Questions

Costs
- C: How much would they be willing to pay in addition for this certification on a product (%)
- P&R: List of costs they may consider important in their decision-making process

Enforcement
- A list of possible organizations that could run the program (e.g., NGO, religious group, current certifiers, etc.)

Benefits
- P&R: List of benefits they could consider important

Information
- C: Types of info that should be included on packages/in stores
- P&R: Types of info that should be passed on to customers

Who/What Certified
- What should be certified/carry a certification stamp (products, retailers, suppliers, etc.)

Inspection
- List of inspection types/techniques (scheduled, random, etc.) for certification renewal

Halal Standards
- List of standards that could be included in a certification

There were also demographics questions included in the surveys. These consisted of the standard socioeconomic questions for individuals typically seen in survey data collection, as well as questions for consumers about their ethnic and cultural background, immigration status or

generation of citizenship, religious history (i.e., born and raised Muslim versus converting/reverting to the faith), subsect of Islam that they practice, and other cultural or religious characteristics that could influence perceptions and preferences related to the U.S. domestic halal meat market. For processors and retailers, the survey also included operation demographics questions. The survey instruments were reviewed with members of the Islamic community for clarity and to ensure there were no misrepresentations.

3.5 Participant Recruitment

The recruitment processes for each of the three groups surveyed – processors, retailers, and consumers – are given below.

3.5.1 Processor Recruitment

I recruited processor participants from three sources: 1) USDA Food Safety and Inspection Service (FSIS) list of registered meat processors, 2) registered processors on Halal Monitoring Services' (HMS) website, and 3) the American Association of Meat Processors (AAMP). Poultry, lamb, beef, and goat processors were included in the sample. While the processors listed on HMS' website are known to be halal, it is also likely that some processors on the USDA FSIS database and the AAMP membership list also process halal meat or poultry products, though the exact number is unknown.

The USDA FSIS database lists 5,859 USDA-inspected poultry, lamb, beef, and goat processing establishments. Of these establishments, the USDA classifies 2,736 as "very small", 2,656 as "small", and 440 as "large" establishments.[11] I conducted stratified random sampling of the three groups of establishments in the USDA FSIS data file, using Excel to generate random

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[11] The USDA classifies processors as "very small" if they have less than 10 employees or less than $2.5 million in annual sales, "small" if they have 10-499 employees, "large" if they have 500 or more employees.

number lists to select establishments from the populations.[12] Establishments were called by a team of undergraduate research assistants beginning in early November 2022 to determine who at the establishment should respond to the survey and obtain email addresses. Email addresses for establishments without a phone number listed or those that did not answer or return calls were retrieved from business websites when available.

Individual Qualtrics survey links were sent via email to the USDA FSIS sample. The first round of emails was sent using MS Word mail merge on December 9, 2022, with follow-up reminder emails on December 13 and 16, 2022. The next reminder email was sent using Constant Contact on January 11, 2023. From the first round of emails, approximately 50 bounced back as undeliverable, and 12 businesses responded saying they did not qualify or would not be taking the survey. Thus, a total of 987 processors from the USDA FSIS list received the survey.

There were an additional 58 registered processors on the Halal Monitoring Services' (HMS) website which were all included in the sample. Emails were obtained from the certifier, and individualized Qualtrics survey links were sent using MS Word mail merge in January 2023, with follow-up reminder emails in January and February 2023. Additionally, these processors were given the option to take the survey in either Arabic or Urdu if they preferred.

The AAMP membership list was contacted via an association representative, who distributed an anonymous Qualtrics survey link to the membership email listserv in March 2023, with reminder emails in March and April 2023. It is likely that many AAMP members received the survey who also were included in my USDA FSIS recruitment efforts. However, the response

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[12] As very small, small, and large processors make up 46.7%, 45.3%, and 7.5% of the total population, respectively, these percentages were used to determine how many establishments to sample from each group. There were 1,049 processors contacted from the USDA FSIS database including 20 large processors, 451 small processors, and 578 very small processors.

rate for both samples was very low, so I do not anticipate there were any duplicate survey responses.

Despite contacting businesses in three different samples, I received only 195 total responses, with only 95 complete responses remaining after data cleaning. I received responses mainly from very small, small, and medium processing plants, both because these make up over 90% of meat processors in the nation and, anecdotally, because larger processors typically do not respond to surveys.

3.5.2 Retailer Recruitment

General and halal meat retailers were recruited between February 2023 and October 2023. Non-halal retailers were recruited via multiple state-level grocers associations and from a membership list from the National Grocers Association (NGA). First, I attempted to recruit retailers via the state-level grocers associations and the NGA email listservs with the assistance of association representatives. However, only 18 responses were received via these efforts, so another recruitment approach was needed. In May of 2023, a team of undergraduate research assistants called retailers from the 2019 winter NGA membership list (National Grocers Association 2019) – the most recent available online – between May 2023 and September 2023 to collect point of contact email addresses. After removing closed businesses, a total of 946 retail stores were called, and 236 email addresses were obtained. As in the processor case, it is possible that some of these retailers actually did have a halal program at the time of the survey, though the exact number of these stores is unknown.

Known halal retailers were recruited from halal certifiers' online lists of registered businesses and through a nationwide web scraping of Yellow Pages using the following key terms and phrases: "halal meat grocery store," "halal meat," "Indo-Pak grocery," "African grocery," and

"international grocery store." The results of the web scraping were compiled, and a team of undergraduate research assistants called the 919 stores between July 2023 and October 2023 to collect email contact information; 96 email addresses were obtained.

Emails with survey links were sent three times to each category of retailers between August 25 and October 10, 2023. Incentive payments of $25 were offered for complete and quality responses, though not all respondents claimed their incentive. In total, 50 responses were collected from the retailer samples, and after data cleaning, 39 viable survey responses remained.

3.5.3 Consumer Recruitment

For Muslim halal meat and poultry consumer recruitment, I partnered with Qualtrics ™ to collect responses to ensure a nationally representative population to sample from. Multiple rounds of recruitment were necessary due to the relatively small number of these consumers nationwide. To qualify for the survey, consumers needed to be practicing Muslims, over the age of 18, the primary grocery shopper for their household, and have bought a halal meat or poultry product in the last 12 months. In total, 507 complete and clean responses to the online survey were collected between May 2023 and December 2023.

4. Methodology & Statistical Framework for Analysis

Multiple methods for data analysis are used in this chapter. First, descriptive statistics are used to detail the characteristics of survey participants and general patterns in their responses. Then, BWS scores are used to determine which attribute to use as the base case for further analysis with random parameter logits (RPLs) models. In particular, common practice is to set the base case for a logit model as the largest or smallest BWS score. From the RPLs, BWS shares are calculated and compared across groups using Poe tests to determine what statistically significant differences in preferences exist between market groups.

4.1 Count Data and Descriptive Best-Worst Scaling Statistics

A descriptive analysis of the BWS data was conducted using BWS scores. BWS scores are computed as the number of times an attribute was selected as most preferred, minus the number of times that attribute was selected as least preferred, divided by the number of times the attribute appears in the design. In this study, each attribute appeared three times in the design. These BWS scores provide another descriptive method for analyzing the data, as well as inform the selection of the base-case in logit models. In the RPL models discussed in the next section, I selected the base case as the smallest BWS score (Inspections) for two out of the three survey groups.

4.2 Best-Worst Scaling Theoretical Foundation & Analytical Methodology

BWS is rooted in random utility theory (RUT), which assumes that agents seek to maximize their expected utility subject to the choices they are presented (McFadden 1974). In RUT, it is assumed that the relative preference for object A over object B is a function of the relative frequency with which A is chosen as better than B for an individual (Louviere et al. 2013).

Individuals make choices randomly, with some error involved, to maximize their utility. The best-worst scaling method presents each individual multiple answer options (in our analysis, attributes of a NHMC program) and asks them to select one as "best" (or most important) and one as "worst" (or least important). In practice, the BWS method consists of a series of several questions, each comprised of different combinations of attributes per question. According to RUT, the utility for respondent *n* in selecting alternative *i* in choice set *t* is:

$$U_{nit} = V_{nit} + \varepsilon_{nit}$$

Equation 14

where V_{nit} is the deterministic portion of utility dependent upon the attributes of the alternative and ε_{nit} is the stochastic component of utility, which is independently and identically distributed over all alternatives and choice scenarios.

Generally, when respondents are presented with a choice set, they make choices based on

maximizing the utility they can receive from each alternative in the choice set. For example, in

making a choice between alternative j and alternative k, respondent n will pick alternative j over

alternative k when:

$$U_{njt} > U_{nkt} \ for \ all \ j \neq k$$

<div align="right">*Equation 15*</div>

Given that each choice set has J attributes, the pair of attributes chosen represents a choice

from all $J(J-1)$ possible pairs, which maximizes the difference in importance. Following Lusk and

Briggeman (2009) and McKendree et al. (2018), let the true or latent unobservable level of

importance for individual n be represented by $I_{nj} = \lambda_j + \epsilon_{nj}$ where λ_j represents j's location on

the scale of importance and ϵ_{nj} is the random error term.

The probability that pair (j, k) is chosen out of a choice set with J attributes, where j

represents the most important attribute and k represents the least important attribute, is the

probability that the difference between j and k is larger than all the $J(J-1) - 1$ other possible

differences in the choice set. When the error terms ϵ_{nj} are independent and identically distributed

type I extreme value, the multinomial logit (MNL) form of this probability is:

$$Prob_n(j \ chosen \ as \ most, k \ as \ least) = \frac{e^{\lambda_j - \lambda_k}}{\sum_{l=1}^{J} \sum_{m=1}^{J} e^{\lambda_j - \lambda_k} - J}$$

<div align="right">*Equation 16*</div>

From this probability statement, by maximizing the log-likelihood function, parameters λ_j can be

estimated. When doing this, the dependent variable is 1 for the chosen most-least attribute pair and

0 for the remaining $J(J-1) - 1$ pairs.

An MNL assumes respondents have homogenous views of the attributes analyzed.

However, past studies have found heterogenous preferences among agricultural supply chain

<div align="center">76</div>

agents (e.g., McKendree et al. 2018, Schulz and Tonsor 2010, Ortega et. al 2019) and consumers in relation to agricultural products (e.g., Ortega et. al 2011, Bazzani et. al 2017, Ubilava & Foster 2009, McKendree et. al 2013). Not only do individuals behave differently, it is likely they also have different motivations behind these decisions. Accordingly, to account for response heterogeneity, both an uncorrelated and correlated random parameters logit (RPL) were estimated (Boxall and Adamowicz 2002) and compared to the MNL for each of the three groups surveyed.

The MNL and RPL models were conducted using NLogit 6 on the BWS data for all three groups in the study. In each group, the correlated and uncorrelated RPLs resulted in statistically significant standard deviations for all attributes and statistically significant coefficients for at least some of the attributes; in the case of the correlated RPLs, the covariances were also strongly statistically significant, confirming heterogeneity of opinions within each group. Thus, I chose to use the results of the correlated RPLs for further analysis and comparisons across the groups.

RPL coefficient estimates cannot be directly interpreted. However, a "share of importance" estimate based on a ratio scale can be calculated for each of the seven attributes of a hypothetical U.S. national halal program included in the BWS portion of the surveys:

$$\text{Share of importance for attribute } j = \frac{e^{\widehat{\lambda_j}}}{\sum_{k=1}^{J} e^{\widehat{\lambda_k}}}$$

Equation 17

These shares provide a more intuitive approach to analyzing the data. The shares and p-values were calculated in MATLAB with the coefficient matrices from NLogit 6. The sum of shares among all seven attributes analyzed must equal one (or 100%). If attribute j has an importance share of 0.3 (30%) and attribute k has an importance share of 0.1 (10%), then j is three times as important as k. Krinsky-Robb confidence intervals (Krinsky & Robb 1986) were calculated as a conservative way to compare statistical differences across importance shares both

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within and across survey groups. Additionally, to test for differences in preference shares across the samples, I use the full combinatorial method from Poe et. al (2005). This allows me to draw conclusions for which attributes are most important to different groups, and how these preferences are displayed across the market. The Krinsky-Robb and Poe tests were conducted in MATLAB using the coefficient and variance matrices obtained from modeling the correlated RPLs in NLogit 6.

5. Results and Discussion

The results of the analysis methods used in this chapter and corresponding discussion are presented by method type in the sections below.

5.1 Descriptive Statistics

Participant demographics by survey group are presented in Table 15 and Table 16. For retailers and processors, the demographic statistics are representative of the survey respondent; relevant operation demographics are included in Table 17.

Table 15: General Participant Demographics by Survey Group

Category	Processors (%)	Retailers (%)	Consumers (%)
Gender (n = 94, n = 33, n = 507)			
Male	76%	79%	49%
Female	19%	21%	50%
Prefer not to disclose	5%	0%	<1%
Education Level (n = 94, n = 32, n = 507)			
Less than High School	0%	0%	2%
High School	6%	3%	20%
Some College	13%	13%	18%
2-Year Degree (Associates)	10%	28%	11%
4-Year Degree (Bachelor's)	44%	25%	27%
Master's Degree	22%	22%	17%
Professional Degree	5%	9%	5%
Prefer not to Disclose	0%	0%	<1%
Race (n = 94, n = 36)			
White	76%	66%	
Black	1%	0%	
Native American or Alaskan Native	0%	5%	
Native Hawaiian or Pacific Islander	0%	2%	
Asian	3%	10%	
Other	6%	2%	
Prefer not to disclose	14%	2%	
Political Party (n = 94, n = 33, n = 507)			
Democrat	5%	6%	40%
Republican	35%	27%	21%
Independent	26%	36%	28%
Other	3%	6%	1%
Prefer not to disclose	31%	24%	9%
1st Generation Immigrant (n = 94, n = 33, n = 507)			
No	82%	91%	70%
Yes	10%	6%	27%
Prefer not to disclose	9%	3%	4%
2nd Generation Immigrant (n = 94, n = 33, n = 507)			
No	66%	82%	52%
Yes	21%	15%	41%
Prefer not to disclose	13%	3%	8%
Currently Religious (n = 94, n = 33)			
Yes	21%	36%	
No	56%	48%	
Prefer not to disclose	22%	15%	
Previously Religious (n = 20, n = 12)			
Yes	45%	58%	
No	40%	42%	
Prefer not to disclose	15%	0%	

Increased specificity for consumer demographics is important to include, as preferences and opinions of Muslim consumers will be influenced more strongly and in different ways by their race, ethnicity, sect of Islam, and status as a convert or revert to Islam (Table 16).

Table 16: U.S. Muslim Halal Consumer Demographics: Race, Ethnicity, and Religion (n = 507)

Category	Percentage
Race and Ethnicity	
White	45%
Black or African American	27%
Middle Eastern or North African	23%
American Indian or Alaskan Native	2%
Asian	8%
South or Southeast Asian	16%
Native Hawaiian or Other Pacific Islander	<1%
Other	3%
Prefer not to Disclose	1%
Sect of Islam	
Sunni	63%
Shia or Shiite	11%
Ibadi	6%
Non-denominational	13%
Other	2%
Prefer not to disclose	5%
Convert or Revert to Islam	33%
Years Since Converting or Reverting to Islam (n = 165)	
0-5 years	23%
6-10 years	17%
11-15 years	17%
16-20 years	10%
21-25 years	7%
26-30 years	7%
31-35 years	5%
Over 35 years	8%
Prefer not to Disclose	6%
Previous Religion (n = 165)	
Christianity	50%
Hinduism	9%
Buddhism	2%
Judaism	5%
Sikhism	2%
Other	5%
None	19%
Prefer not to Disclose	7%

Unsurprisingly, the demographic patterns of the supply-side agents differ from consumers. While the majority of supply-side agents were male, white, and had at least a 4-year degree, consumers were evenly split amongst genders, were a much wider variety of races, and were generally less educated overall. Supply-side agents were more commonly Republicans or Independents, while consumers were more likely to be Democrats. Consumers were more likely to be first- or second-generation immigrants and 100% were currently religious (non-religious individuals were screened out of the survey), compared to 21% and 36% of processors and retailers, respectively. These general differences in survey groups may help to explain differences in preferences and opinions across groups for a potential U.S. NHMC program.

Muslim consumers' demographics provide even more detailed information that can explain variability in preferences. While the largest group of consumers is white, there are also large percentages of other races and ethnicities represented in the survey. Likewise, the majority of consumers represented are Sunni Muslims (the most common across the world and the most likely to follow stricter halal dietary standards), though other denominations are well represented. Further, one-third of the sample were Islamic converts (also commonly referred to as reverts), with the majority converting within the last 15 years. Recent converts may display different preferences than life-long Muslims. Finally, one-half of converts were previously Christians, who may display different preferences or opinions than converts from other religions or those who had not previously followed a religion.

Table 17: Processing and Retailing Establishment Summary Statistics

Category	Processors (n = 95)			Retailers (n = 41)		
Establishment Type						
Slaughter without processing	7%			N/A		
Processing without slaughter	44%			N/A		
Slaughter and processing	45%			N/A		
Other	3%			N/A		
Grocery Store	N/A			80%		
Butcher Shop/Deli	N/A			12%		
Other	N/A			7%		
Location						
Rural	48%			61%		
Suburban	23%			33%		
Urban	23%			6%		
Prefer not to disclose	6%			N/A		
Type of Animals Processed/Sold						
Beef	83%			100%		
Veal	34%			41%		
Lamb	55%			56%		
Pork	46%			85%		
Turkey	35%			95%		
Chicken	38%			100%		
Goat	55%			17%		
Exotics	35%			34%		
Halal Status						
Current Halal	34%			22%		
Past Halal	4%			10%		
Never Halal	62%			51%		
Unsure	N/A			17%		
No. of Employees	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Min**
	62	2	850	45	1	600
Year Established	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
	1992	1902	2022	1979	1867	2021

The processors and retailer operation demographics in Table 17 show that supply-side responses came from a variety of different business types, ages, and sizes. For processors, many establishments slaughtered multiple species of animals; likewise, retailers sold products from

multiple species. Finally, halal businesses were represented in each sample. The variety of businesses and heterogeneity in their characteristics helps to ensure the data collected is fairly representative of each group's national population.

5.2 Attribute Preferences

The count data and corresponding descriptive discussion of the best-worst question responses is given in Appendix A.3. Figure 8 presents the descriptive results based on the BWS scores. The scores reveal the most and least important attributes to consider for each of the three groups. The BWS scores provide information on the ideal base case for the RPL model; in this instance, I selected the least important attribute for two of the three groups (Inspections) as the base case.

Figure 8: Best-Worst Scores for Processors, Retailers, and Consumers
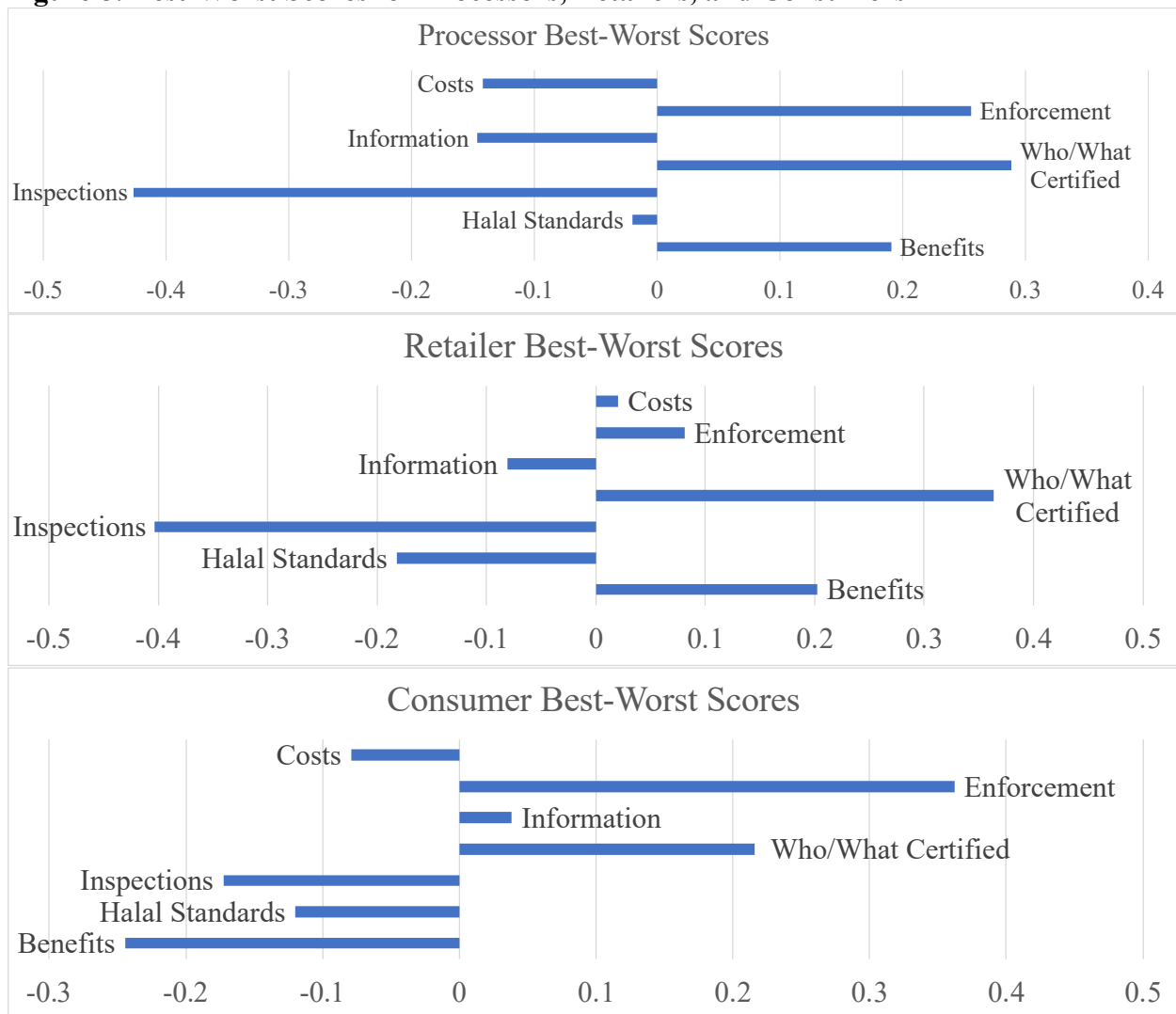
The coefficients for the correlated RPLs are given in Table 18, while the additional variance and correlation matrices for the correlated RPLs and the results for the uncorrelated RPLs and MNLs are given in Appendix A.3. In all models, the Inspection attribute of a hypothetical U.S. NHMC program – has been dropped to avoid multicollinearity. Therefore, the coefficients reflect the importance of each of the six attributes relative to Inspection, which was normalized to zero for identification purposes as it was the least important attribute to processors and retailers, and the second least important attribute to consumers (based on the BWS scores).

The correlated RPL results are generally consistent with the BWS scores. For processors, all attributes of the best-worst scales are statistically significant at least at the 5% level, excluding Benefits, which was not significant. For retailers, all attributes are statistically significant at least at the 10% level, excluding Enforcement and Halal Standards; for consumers, all attributes are statistically significant at the 10% level, excluding Benefits. The results indicate that Who/What is Certified is the most preferred attribute for retailers and processors, closely followed by Halal Standards and Costs for processors, as well as Costs for retailers. For consumers, Halal Standards and Who/What is Certified are the top two preferred attributes. On the other hand, Information was the least preferred attribute (least important to consider) for processors and retailers, while consumers indicated that the Costs were least important.

The importance shares from the correlated RPLs are given in Table 19. Importance shares results for the uncorrelated RPLs and MNLs are given in Appendix A.3. Results show that 23% of processors view the attributes Who/What is Certified and Halal Standards as the most important attribute for program designers to consider when developing a hypothetical U.S. NHMC program. Who/What is Certified was the most important attribute for program designers to consider for retailers (27%) and the second most important for program designers to consider for consumers (18%). Halal Standards was the fourth most important attribute for program designers to consider for retailers (13%) and the most important attribute for program designers to consider for consumers (22%). I see the most consensus in rankings of attribute importance between the two supply chain members (processors and retailers), while the preferences of consumers are more divergent. These differences between the supply and demand sides of the market are unsurprising and illustrate the general challenges of food policy making and, more specifically, the diversity of

preferences for what is most important to affected market participants when designing a NHMC program.

Finally, I conducted pair-wise Poe tests on the preference shares associated with each of the seven attributes considered in the BWS for a hypothetical NHMC program. Table 20 presents the p-values from the Poe tests, with values under 0.05 indicating the two groups' shares are statistically different at the 5% level. Poe test results for the uncorrelated RPLs and MNLs are given in Appendix A.3. Overall, the results reveal patterns of preferences between the three groups in the study. Unsurprisingly, the Poe test shows that consumers' preferences across the attributes of a hypothetical national U.S. halal certification program are significantly different from those of the processors and retailers. Consumers place stronger, more positive emphasis on Inspection relative to retailers and Halal Standards. On the other hand, consumers place stronger and more negative emphasis on the Costs and Who/What is Certified than both processors and retailers, and Benefits and Inspection when compared to processors. As for processors and retailers, their responses are overall very similar; there are only two statistically significant differences on the attributes Enforcement and Benefits. The BWS shares indicated that processors valued Enforcement more than retailers, while retailers valued Benefits more than processors.

Table 18: Correlated Random Parameters Logit Results of Best-Worst Scaling for Hypothetical U.S. National Halal Meat and Poultry Certification Program: Processors (n = 82), Retailers (n = 33), and Consumers (n = 507)

Best-Worst Scaling Attributes	Processors Coefficient (st. error)	Retailers Coefficient (st. error)	Consumers Coefficient (st. error)
Cost of Certification	0.92*** (0.16)	0.91*** (0.25)	-0.35*** (0.05)
Enforcement and Regulation	0.29** (0.14)	-0.18 (0.23)	-0.09* (0.05)
Information Collected/Available	-0.81*** (0.16)	-0.79*** (0.24)	-0.20*** (0.05)
Who/What Must be Certified	0.99*** (0.15)	1.05*** (0.23)	0.29*** (0.05)
Which Halal Standards are Included	0.97*** (0.15)	0.35 (0.24)	0.52*** (0.05)
Benefits of Certification	-0.047 (0.15)	0.40* (0.24)	0.07 (0.05)
McFadden Pseudo R^2	0.23	0.24	0.12
N	574	231	3549
Log likelihood	-860.64	-342.56	-6053.56
AIC	1775.30	739.10	12161.1
AIC/N	3.09	3.20	3.43

Note: *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$. Base attribute normalized to zero is Inspection Type/Frequency.

Table 19: Best-Worst Scaling Shares of Preferences for Hypothetical U.S. National Halal Meat and Poultry Certification Program: Consumers, Retailers, & Processors: Correlated Random Parameters Logit

National Halal Meat & Poultry Certification Program Attribute	Processors (n = 82)		Retailers (n = 33)		Consumers (n = 507)	
	Share	95% CI	Share	95% CI	Share	95% CI
Cost of Certification	0.22***	[0.18, 0.26]	0.24***	[0.17, 0.30]	0.09***	[0.09, 0.10]
Enforcement and Regulation	0.12***	[0.10, 0.14]	0.08***	[0.06, 0.11]	0.12***	[0.11, 0.13]
Information Collected/Available	0.04***	[0.03, 0.05]	0.04***	[0.03, 0.06]	0.11***	[0.10, 0.12]
Who/What Must be Certified	0.23***	[0.20, 0.27]	0.27***	[0.21, 0.34]	0.18***	[0.17, 0.19]
Inspection Frequency and Type	0.09***	[0.07, 0.10]	0.09***	[0.07, 0.13]	0.13***	[0.12, 0.14]
Which Halal Standards are Included	0.23***	[0.19, 0.27]	0.13***	[0.09, 0.19]	0.22***	[0.21, 0.24]
Benefits of Certification	0.08***	[0.07, 0.10]	0.14***	[0.10, 0.19]	0.14***	[0.13, 0.15]

Note: *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

Table 20: P-values from Poe tests for Hypothetical U.S. National Halal Meat and Poultry Certification Program: Pair-wise Comparisons Between Processors (n = 82), Retailers (n = 33), and Consumers (507)

National Halal Meat & Poultry Certification Program Attribute	Processors vs. Retailers	Processors vs. Consumers	Retailers vs. Consumers
Cost of Certification	0.68	**0.00**	**0.00**
Enforcement and Regulation	**0.03**	0.68	0.99
Information Collected/Available	0.34	**0.01**	**0.01**
Who/What Must be Certified	0.16	**0.00**	**0.00**
Inspection Frequency and Type	0.33	**0.00**	**0.02**
Which Halal Standards are Included	1.00	0.58	**0.00**
Benefits of Certification	**0.00**	**0.00**	0.44

Note: Values that are statistically significant at the 5% level or better are bolded.

5.3 Follow-Up Questions: Certification Specifics

Follow-up questions for each of the BWS attributes allow me to dig deeper into the nature of participants' preferences for a hypothetical U.S. NHMC program. Descriptive statistics for these follow-up questions are given by survey group in Table 21-Table 30. Note that the number of respondents for processors and retailers is slightly higher for these questions than the BWS questions, as not all processors and retailers completed all BWS questions, thus excluding these participants from the MNL and RPL panel analyses.

The BWS scores, RPL coefficients, and BWS shares for the three groups provided consistent preference patterns for different attributes of a hypothetical U.S. NHMC program. To summarize, processors' results showed Who/What is Certified, Halal Standards, and Costs as the most important attributes for program designers to consider when developing a hypothetical U.S. NHMC program. Retailers' results showed Who/What is Certified and Costs as the two most important attributes for program designers to consider when developing a hypothetical U.S. NHMC program. Muslim halal consumers' results identified Halal Standards and Who/What is Certified as the two most important attributes for program designers to consider when developing a hypothetical U.S. NHMC program. I now discuss these results in more detail by group – and by halal versus non-halal supply chain members where applicable – using additional information gathered from the follow-up questions and qualitative interview quotes for further context.

Table 21 provides more detail on the Halal Standards preferred by group. Between non-halal processors and halal processors only, the results show an increased preference for each of the given possible standards by halal processors. This increase in strength of preferences makes sense, as halal processors are both more knowledgeable of the halal process and have more at stake when defining standards than those currently outside of the market. These responses also support the

interview findings that halal processors generally favor standards that are more closely associated with hand slaughter (e.g., zabiha slaughter method, slaughterers of Muslim faith, individual spoken blessings, and no stunning).

For halal consumers, the results show more variability in preferences, with consumers indicating stronger preferences for additional quality attributes not typically included in current halal certifications used in the U.S. (e.g., animals face Mecca and non-GMO) (Table 21). These variations in consumers' preferences and the generally smaller percentages of consumers indicating that any one standard was preferred are unsurprising given the diversity in Islamic sect, racial, and ethnic backgrounds of the consumer sample. Furthermore, consumers interviewed in the earlier phase of this project who are less strict in their halal dietary requirements indicated little to no preference between zabiha and machine slaughter or the faith of the slaughterer, for example.

Table 22 provides more information on opinions on the attribute Who/What is Certified. For all retailers and processors, the majority want a hypothetical U.S. national halal certification program to require certification of individual products (>63%) and supply chain members (>50%). For those that want supply chain members to have certification, the supply chain agents indicated slaughter (>91%) and processing (>83%) establishments were the most preferred to be certified. A higher percentage of halal processors and retailers indicated that supply chain agents should be certified, which matches the opinions of nearly all halal processors and retailers interviewed. The interviewees valued a halal supply chain with strict and well-defined certifications for each member to ensure their good name and product quality were maintained. Additionally, halal retailers interviewed indicated they rely heavily on their reputation within their local communities and word-of-mouth of happy customers; thus, strong certification utilization is important.

I asked processors and retailers to indicate which of the given costs of a U.S. NHMC program would be most important to their businesses (Table 23). The cost categories indicated as important were consistent between non-halal processors and halal processors, with the most notable difference being the costs of potential establishment modifications; 67% of non-halal processors and 34% of halal processors indicated this was an important factor. The higher percentage of non-halal processors who considered the costs of establishment modifications to be important is logical, as these processors do not currently have a halal program and therefore their establishments may not currently have the infrastructure to add a halal program. There were notable differences in which cost categories were most important for non-halal retailers and halal retailers. Forty-one percent of non-halal retailers and 67% of halal retailers indicated certification fees were an important factor, while 50% of non-halal retailers and 33% of halal retailers indicated the costs of potential establishment modifications were important.

Table 21: Market Participants' Preferred Halal Standards for a U.S. National Halal Meat and Poultry Certification Program

Preferred Halal Standards	Non-Halal Processors (n = 66)	Halal Processors (n = 32)	Non-Halal Retailers (n = 32)	Halal Retailers (n = 9)	Halal Consumers (n = 507)
Zabiha (hand-slaughter)	76%	88%	22%	78%	53%
Machine slaughter	9%	22%	16%	0%	19%
Slaughterers of Muslim faith	12%	75%	6%	67%	58%
Slaughterers of Jewish or Christian faith	8%	16%	9%	33%	14%
Individual spoken blessings	8%	47%	16%	33%	36%
Animals not stunned	3%	38%	22%	44%	35%
Animals face Mecca	3%	22%	3%	33%	33%
Non-GMO	3%	6%	22%	11%	32%
Other	8%	6%	13%	0%	0%

Table 22: Market Participants' Opinions on Who or What Should be Certified Under a U.S. National Halal Meat and Poultry Certification Program

Who or What Certified	Non-Halal Processors (n = 66)	Halal Processors (n = 32)	Non-Halal Retailers (n = 32)	Halal Retailers (n = 9)	Halal Consumers (n = 507)
Individual Products	80%	75%	63%	78%	79%
Supply Chain Members	58%	72%	50%	67%	77%
Which Supply Chain Members? (n = 61, 38, 22, 16, 392)					
Slaughter Establishments	92%	96%	94%	83%	76%
Processing Establishments	84%	91%	88%	100%	66%
Transportation/ Distributors	24%	57%	31%	100%	52%
Retailers/Wholesalers	32%	65%	44%	100%	66%
Restaurants and Food Service	34%	61%	38%	100%	57%
Other	5%	0%	0%	0%	1%

Table 23: Costs of U.S. National Halal Meat and Poultry Certification Considered Most Important

Program Cost Category	Non-Halal Processors (n = 66)	Halal Processors (n = 32)	Non-Halal Retailers (n = 32)	Halal Retailers (n = 9)
Certification Fees	35%	47%	41%	67%
Establishment Modifications	67%	34%	50%	33%
Increased Labor Hours Needed	42%	28%	28%	33%
Cost of Traceability Equipment	38%	31%	44%	44%
Other	2%	0%	0%	0%

5.4 Follow-Up Questions: Program Implementation and Transparency

The development of a U.S. NHMC program will be complex and subject to a wide array of market participants' preferences, as seen in previous U.S. national certification program development processes (e.g., USDA Organic). Nonetheless, the results of my surveys and analysis provide initial context and guidance for the potential future development of such a program. There are no glaring differences in opinions and preferences that would preclude the development of a

national program across the three study groups. However, other factors must be considered when designing a national-level certification program; specifically, who would set the standards for and enforce such a program, how certifications would be administered and audited, and the amount and nature of program transparency.

5.4.1 Program Standards and Enforcement

Halal is a religious attribute of a food product and is defined by interpreting religious texts; thus, the First Amendment to the U.S. Constitution prohibits federal, state, and local governments from setting or specifying halal standards. Therefore, the choice of which halal standards to include or exclude from a national program would fall to non-government organizations (NGOs) – potentially including consumer advocacy groups, religious organizations, certifier and producer organizations, and supply chain members. Table 24 shows market participants' opinions of which of these groups should have a say in setting these standards. Reaching a consensus on halal standards amongst so many different voices is likely to be difficult; therefore, identifying which types of organizations should lead this effort is critical. In interviews, multiple halal processors, halal retailers, and Muslim halal consumers all indicated that religious organizations were their most preferred option for setting halal standards, followed to a lesser extent by certifiers and non-government groups. Indeed, based on the results of market participants' opinions presented here, the ideal candidates to work together to set halal standards should be religious (44-89%), certifier (31-48%) and non-government (11-28%) organizations.

Enforcement of a predetermined religious standard is not prohibited by the First Amendment; therefore, options for program enforcement include federal and state government organizations such as the USDA or state-level departments of agriculture. With this expansion of options, the organizations most preferred to be in charge of program management and enforcement

are religious (22-67%), U.S. government (11-53%), and certifier organizations (19-35%). These findings match interview findings; multiple halal processors, retailers, and consumers all expressed their desire for a U.S. government-backed certification program, with input from religious and certifier organizations.

Table 24: Market Participants' Opinions on Who Should Set and Enforce Standards for a U.S. National Halal Meat and Poultry Certification Program, Aggregated

Organizations	Non-Halal Processors (n = 66)		Halal Processors (n = 32)		Non-Halal Retailers (n = 32)		Halal Retailers (n = 9)		Halal Consumers (n = 507)	
	Set	Enforce	Set	Enforce	Set	Enforce	Set	Enforce	Set	Enforce
U.S. Government Organizations	N/A	44%	N/A	53%	N/A	28%	N/A	11%	N/A	51%
State Government Organizations	N/A	18%	N/A	22%	N/A	28%	N/A	22%	N/A	35%
Non-Government Organizations	23%	14%	28%	19%	28%	16%	11%	44%	25%	21%
Religious Organizations	49%	30%	63%	44%	44%	22%	89%	67%	66%	49%
Certifier Organizations	32%	33%	31%	19%	34%	34%	33%	33%	48%	35%
Producer Organizations	20%	11%	9%	0%	19%	6%	22%	0%	30%	23%
Slaughterers & Processors	28%	11%	28%	19%	6%	13%	0%	22%	29%	31%
Wholesalers & Distributors	5%	3%	3%	0%	25%	3%	33%	0%	42%	23%
Retailers & Restaurants	3%	0%	3%	0%	6%	3%	0%	0%	22%	18%
Other	6%	3%	6%	3%	0%	0%	0%	0%	0%	0%

Note: Due to the religious freedom protections of the First Amendment, governments are prohibited from setting or defining religious practices; in this case, halal standards.

5.4.2 Certification Administration and Auditing

Proper enforcement of a U.S. NHMC program will require defined standards for administering certifications and auditing certified agents and products. However, administration and auditing of certifications is more than just setting standards – a defined method and timeline for inspections is ideal to ensure initial and ongoing compliance. Table 25 shows survey participants' preferences for the types of inspections or audits that should be conducted to ensure supply chain members' compliance and retain certification. The results show that the majority of the market prefers random or a mixture of scheduled and random inspections or audits. This is unsurprising, as multiple interview participants across all three groups expressed their concern that exclusively using scheduled audits could allow for certifications to be granted to dishonest supply chain members. Furthermore, these preferences are in line with the nature in which many certification programs are managed in a variety of contexts, and therefore should not pose a challenge to implement.

Table 25: Market Participants' Opinions for how Certified Suppliers Under a U.S. National Halal Meat and Poultry Certification Program Should be Audited

Inspection Type	Non-Halal Processors (n = 38)	Halal Processors (n = 23)	Non-Halal Retailers (n = 16)	Halal Retailers (n = 6)	Halal Consumers (n = 392)
Scheduled	47%	22%	44%	0%	19%
Random	5%	22%	6%	50%	29%
Mixed Scheduled & Random	42%	57%	50%	50%	52%
Other	5%	0%	0%	0%	0%

Note: The number of participants is lower for this question, as only survey participants who indicated that they preferred supply chain members be required to hold certification saw this question in the survey.

5.4.3 Program Transparency and Traceability

Finally, it is vital to consider the transparency and traceability of a certification granted under a hypothetical U.S. NHMC program. Consumers are increasingly interested in having access to information about where and how their food is produced, as well as having the ability to self-

authenticate labels and other quality indicators in real-time. Likewise, supply chain members are in favor of employing transparency and traceability efforts to ensure their products are viewed as authentic and trustworthy to their customers. I asked survey participants about who should have access to four main types of information that relate to a hypothetical U.S. NHMC program; the results are shown in Table 26 - Table 29.

First, survey participants were asked which groups should have access to traceability information for individual products (Table 26) and who should have access to a list of all certified establishments (Table 27). The majority of survey participants indicated that the general public, slaughter and processing establishments, wholesalers and distributors, and retailers and restaurants should have access to both of these types of information. Halal supply chain members were more in favor of these groups having access to this information than non-halal supply chain members. Second, survey participants were asked who should have access to a list of all enforcement agencies that would be responsible for issuing and auditing certifications (Table 28) and who should have access to the list of halal standards included in the certification (Table 29). Again, most survey participants indicated that the general public, slaughter and processing establishments, wholesalers and distributors, and retailers and restaurants should have access to this information; additionally, the majority of halal processors again indicated that government organizations should be able to access this information. Again, halal supply chain members were more in favor of these groups having access to this information than non-halal supply chain members. Finally, I asked survey participants how the general public should have access to any of the traceability or transparency information asked about in these four questions; these results are shown in Table 30.

. All three groups were strongly in favor of online access and halal processors, non-halal and halal retailers, and consumers also favored the ability to use a QR code or cell phone app.

These responses show that generally, there is strong interest in ensuring a U.S. NHMC program has robust transparency and traceability attributes. Overall, the results of these survey questions align with opinions expressed by interviewees; the majority of interviewees were in favor of a U.S. NHMC with robust transparency and traceability attributes.

Table 26: Market Participants' Opinions on Which Groups Should Have Access to <u>Traceability Information</u> for Individual Products Under a U.S. National Halal Meat and Poultry Certification Program

Groups That Should Have Access to Traceability Information	Non-Halal Processors (n = 66)	Halal Processors (n = 32)	Non-Halal Retailers (n = 32)	Halal Retailers (n = 9)	Halal Consumers (n = 507)
General Public	59%	84%	53%	56%	62%
Slaughter & Processing Establishments	59%	75%	53%	78%	59%
Wholesalers & Distributors	59%	81%	59%	78%	55%
Retailers & Restaurants	52%	84%	53%	56%	55%
Government Organizations	41%	66%	31%	33%	32%
None	8%	0%	3%	0%	2%

Table 27: Market Participants' Opinions on Which Groups Should Have Access to a <u>List of all Certified Establishments</u> Under a U.S. National Halal Meat and Poultry Certification Program

Groups That Should Have Access to List of all Certified Establishments	Non-Halal Processors (n = 66)	Halal Processors (n = 32)	Non-Halal Retailers (n = 32)	Halal Retailers (n = 9)	Halal Consumers (n = 507)
General Public	64%	88%	59%	67%	60%
Slaughter & Processing Establishments	59%	81%	53%	67%	59%
Wholesalers & Distributors	64%	88%	56%	67%	55%
Retailers & Restaurants	58%	88%	56%	56%	55%
Government Organizations	47%	66%	38%	33%	33%
None	9%	0%	3%	0%	2%

Table 28: Market Participants' Opinions on Which Groups Should Have Access to a <u>List of all Enforcement Agencies</u> Under a U.S. National Halal Meat and Poultry Certification Program

Groups That Should Have Access to List of all Enforcement Agencies	Non-Halal Processors (n = 66)	Halal Processors (n = 32)	Non-Halal Retailers (n = 32)	Halal Retailers (n = 9)	Halal Consumers (n = 507)
General Public	55%	81%	53%	78%	60%
Slaughter & Processing Establishments	56%	75%	53%	56%	53%
Wholesalers & Distributors	53%	75%	59%	67%	53%
Retailers & Restaurants	45%	75%	53%	56%	50%
Government Organizations	49%	66%	34%	33%	35%
None	11%	0%	3%	0%	2%

Table 29: Market Participants' Opinions on Which Groups Should Have Access to a <u>List of Halal Standards Included</u> in a U.S. National Halal Meat and Poultry Certification Program

Groups That Should Have Access to List of Halal Standards Used	Non-Halal Processors (n = 66)	Halal Processors (n = 32)	Non-Halal Retailers (n = 32)	Halal Retailers (n = 9)	Halal Consumers (n = 507)
General Public	64%	81%	53%	78%	57%
Slaughter & Processing Establishments	62%	81%	53%	56%	58%
Wholesalers & Distributors	59%	78%	53%	67%	57%
Retailers & Restaurants	52%	72%	50%	56%	55%
Government Organizations	48%	69%	44%	33%	33%
None	8%	0%	3%	0%	2%

Table 30: Market Participants' Opinions on how the General Public Should Have Access to Information Related to a U.S. National Halal Meat and Poultry Certification Program

Information Access Method	Non-Halal Processors (n = 46)	Halal Processors (n = 29)	Non-Halal Retailers (n = 20)	Halal Retailers (n = 7)	Halal Consumers (n = 411)
Online website	100%	100%	95%	100%	74%
Using a QR code or cell phone app	39%	52%	65%	86%	53%
Freedom of Information Act (FOIA)	35%	31%	35%	0%	55%
Other	0%	0%	0%	0%	<1%

Note: The number of participants is lower for this question, as only survey participants who indicated that the general public should have access to information related to a U.S. NHMC program saw this question in the survey.

6. Implications for Implementation

As previously discussed, the modern-day U.S. halal meat and poultry certification landscape is complex. There are many competing players with differing standards, approaches to certification, and market segments. This complicates efforts to develop a uniform standard for the U.S. market. However, halal meat and poultry market participants' interest in a U.S. government-backed approach to increased market regulation is coming to fruition, though not specifically for halal products. The USDA under the Biden administration has made efforts to expand transparency, diversity, and accessibility in local meat and poultry processing, via the Executive Order on Promoting Competition in the American Economy, the 2021 American Rescue Plan, and the USDA's Meat and Poultry Supply Chain initiatives, among other methods (The United States Government 2022, United States Department of Agriculture 2023).

Additional concerns of halal market participants can be addressed by the federal government. Supply-side survey respondents indicated that the potential costs– such as certification fees and establishment modifications – of participating in a NHMC program are of concern; however, it is possible that federal grant programs could alleviate these financial burdens. The Biden administration has provided the USDA with increased funding for grant programs including the Meat and Poultry Inspection Readiness Grant Program (MPIRG), the Meat and Poultry Processing Capacity Technical Assistance Program (MPPTA), the Local Meat Capacity Grant (LocalMCap), and the Indigenous Animals Grant (IAG), which together aim to support the growth of the meat and poultry supply chain, increase access to inspection and certification programs, expand domestic processing capacity, and improve the ability of independent facilities to serve more customers in more markets (United States Department of Agriculture 2023). These grants are available to very small and small meat processors to "Increas[e] access to

slaughter/processing facilities for smaller farms and ranches, new and beginning farmers and ranchers, socially disadvantaged producers, veteran producers, and/or underserved communities" and promote efforts for "developing new and expanding existing markets" (United States Department of Agriculture Agricultural Marketing Service 2024). These efforts are important steps for the overall U.S. meat and poultry supply chain that also benefit the halal market.

Furthermore, additional rulemaking endeavors and investigations are underway by the USDA's Packers and Stockyards Division to expand and strengthen the USDA's ability and authority to foster and regulate a more diverse, equitable, and transparent meat and poultry supply chain (The United States Government 2022). Results of these investigations may provide new legal precedent for enforcing and regulating transparency and labeling in the meat and poultry supply chain, which will address some of halal market participants' concerns about the appropriate utilization of halal certifications and information accessibility. Likewise, the new rules will enable the USDA to prosecute unfair, deceptive, and anticompetitive behavior in the meat and poultry industry, which will strengthen the authenticity of labeled products. Altogether, the financial and legal efforts at the federal level point to increased interest in revitalizing the U.S. domestic meat and poultry industry. This revitalization will include diversification of the products available to consumers – such as certified halal products – and improvements in enforcement of traceability, labeling, and other authenticity verification strategies that would positively impact the certification landscape of the halal meat and poultry market. While these efforts are not explicitly directed at the U.S. domestic halal meat and poultry certification landscape, they have and will continue to improve upon certification-related issues such as transparency, information access, certification costs and benefits, enforcement, and regular inspections – all of which are areas of concern for the halal market.

Taken together, public opinion and current presidential leadership do not provide a clear answer as to whether a NHMC program will be developed in the near future, nor how it would likely be implemented. However, a more transparent, well-regulated U.S. domestic halal meat and poultry market is possible without direct federal intervention in the halal market, as discussed above. Further, consumer right-to-know legislation provides legal protections for enforcing appropriate certification utilization without violating the religious protections in the First Amendment. Thus, we have the necessary legal framework to facilitate the proper use of a U.S. domestic NHMC program, were one to be developed. The only remaining piece of the certification implementation process is the certification program itself. The results of this study help identify market's preferences for the attributes of a NHMC program. However, a significant hurdle in developing a NHMC will be reaching a consensus on standards amongst the many different groups in the market. If this can be achieved, U.S. domestic halal meat certifiers develop the NHMC program, thereby simplifying and strengthening U.S. domestic halal meat and poultry certification. Finally, the NHMC program can be implemented effectively by coordinating with federal and state governments as needed for proper labeling enforcement and management.

However, the development of a national certification program in the U.S. is complex, as seen in the years-long refinement and adoption of the USDA organic certification. Nonetheless, the logistical and institutional experience of developing the USDA organic certification can inform and aid in the process of designing a U.S. national halal meat certification program. Most notably, perhaps, is the way in which program development can incorporate the preferences of stakeholders and consumers. The variation in opinions and preferences for a NHMC program's standards and structure from market agents and how they may impact how a NHMC program would operate are important to consider for the program to be successful. Additionally, when developing such a

program, the U.S. can take cues from current halal meat and poultry certification programs in place throughout the world, in terms of organizational structure, transparency standards, implementation process, and many other attributes.

7. Conclusions, Limitations, and Future Work

There is a lack of clarity and standardization in certifications in the U.S. halal meat and poultry market that makes it challenging for participant – including processors, retailers, and consumers – to engage fully and confidently in the market. Indeed, in interviews conducted for this research, Muslim halal meat consumers and current halal meat retailers and processors expressed concern over the lack of transparent and standardized certification requirements and shared desires for the development of such a system. These issues leave much to be desired for Muslim Americans. Thus, the purpose of this study was to understand what the U.S. domestic halal market participants want out of a NHMC program, and how these desires compare to what is feasible to implement. I achieved this objective by investigating the preferences for a NHMC program for processors, retailers, and Muslim halal meat consumers. I used a mixed methods design employing qualitative interviews and stacked surveys with BWS. In all, the findings of this chapter aid in bolstering halal meat consumer confidence in the authenticity of their products, as well as improve the equity of the U.S. food system.

My analysis reveals the preferences of market participants for the design and implementation of a U.S. NHMC program and the potential challenges that may be faced in developing such a program. By studying patterns in processors', retailers', and consumers' preferences for different attributes of a U.S. NHMC program, I determine common characteristics that should be carefully considered in program design to meet the market's needs. Results show that the market overall prefers that program designers consider most carefully Who/What is

Certified, Halal Standards, and Costs when developing a U.S. NHMC program. The results show that the implementation of a NHMC designed by non-governmental agencies and backed by federal consumer-right-to-know legislation may be ideal. In this manner, the First Amendment is not violated, but Muslim Americans are granted further religious security. Finally, the data indicated that multiple transparency and traceability measures should be included to ensure a robust and trustworthy program.

The hurdles to designing a U.S. NHMC program described in this research are notable, but not insurmountable. The design of a U.S. NHMC program will involve multiple groups' opinions and the need to consider a variety of religious and non-religious preferences for program attributes. The most difficult part of the process will be reaching a consensus on standards amongst many different groups without government involvement, and then coordinating with federal and state governments as needed for proper enforcement and management without violating the First Amendment. Despite this challenge, the results of the analyses described in this work provide detailed information on which attributes are important to consider while developing a U.S. NHMC program, and also shed light on how to best suit the needs and wants of the market. With this information, program designers will be well equipped to develop a U.S. NHMC program. Furthermore, steps to strengthen the U.S. meat and poultry industry's transparency, equity, and authenticity in general have already begun to be implemented by the Biden administration and the USDA, and consumer right-to-know legislation is in place to enforce proper certification utilization in the food system overall. Thus, the U.S. domestic halal meat and poultry market is in

a prime position to implement a national certification; the only missing piece is the certification program itself.

Despite these novel findings, there are some limitations of this study. First, collecting data from supply-side agents in any market is notoriously difficult, which led to lower response rates and lower numbers of quality observations in my BWS datasets. As such, the sample sizes for processors and retailers were much smaller than the sample of consumers and may not be representative of the industry in this analysis. However, the findings from the interviews are consistent with those from the surveys, suggesting that the results and conclusions are reasonably sound and representative of the market despite the small sample sizes.

Moving forward there is need for additional research focused on the potential structure and design of a U.S. NHMC program. As my analysis is exploratory in nature, additional research should be conducted to better describe the attribute preferences expressed in the BWS. A deeper understanding of these preferences would aid in the design of a more effective program. To achieve this, future work would benefit from larger sample sizes for processors and retailers to ensure more representative data. As in the case of Essay 1, there are two methods that I believe could be effective for increasing sample size when working with these populations. First, utilizing a team of researchers to conduct in-person or virtual (e.g., Zoom or phone) surveys in real-time may increase response rates and quality, as processors and retailers are typically less likely to complete surveys. Secondly, some of the U.S. halal processor and retailer communities are nonnative English speakers, especially older individuals and recent immigrants. As such, researchers may benefit from close partnerships with native Arabic and Urdu speakers when collecting data from halal businesses to increase participation rates.

Additionally, future investigation into the design and implementation of a U.S. NHMC program would benefit from more information on the process for making complex food and agricultural policies, regulations and laws, especially in the case of religious standards. Potential avenues to acquire this knowledge would be interviews with representatives of the USDA, Congresspersons, individuals who helped to design the USDA Organic standards, and government or certifier representatives from other countries around the world that have national level halal meat and poultry certification programs.

Overall, my findings and additional suggestions for additional research will help future work make meaningful contributions to our understanding and support of regulation and certification within this unique market, as well as add to the literature on the design of policies to support both supply-side agents and consumers.

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CHAPTER 3. RESOLVING THE REALITY GAP IN FARM REGULATION VOTING MODELS

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1. Introduction

Throughout the world, many national, provincial, state, and local jurisdictions engage in legislative efforts to regulate food production systems beyond federal or overarching requirements. This behavior has been seen recently with members of the European Union (EU), including Germany, Italy, Spain, France, and the United Kingdom (UK)[13], who have passed additional agricultural production regulations beyond the EU's standards (Vogeler, 2019a, 2019b). Similarly, over the past two decades in the United States (US), some states have made concerted efforts to wrest from Congress the regulatory control of food production systems within their borders (Neill et al., 2020). These state regulatory efforts tend to focus on socially controversial agricultural practices, such as genetically modified varieties or use of production enclosures or farming practices deemed not to promote farm animal welfare (FAW).

The resulting laws can have substantial negative economic effects for agricultural producers, including unfunded mandates and vote-buy gaps (Sumner et al., 2008). Unfunded mandates in agriculture arise when a law passes that requires changes to agricultural production

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[13] These regulations were passed prior to the UK's withdrawal from the EU in 2020.

practices but provides no monetary assistance to the producer to implement these changes (Paul et al., 2019). A vote-buy gap occurs when citizens vote or express support for a law to regulate products, but then demonstrate little demand for these specialized products (Norwood et al., 2019). Further, these regulations effect producers and consumers both in-state (Sumner et al., 2008; Malone & Lusk, 2016; Mullally & Lusk, 2018; Ortega & Wolf, 2018) and out-of-state (Carter et al., 2021; Carter & Schaefer, 2019; Sumner, 2017).

The rise of piecemeal state legislation surrounding labeling of genetically modified foods led Congress to implement the National Bioengineered Food Disclosure Standard (NBFDS), which preempts state efforts to regulate the labeling of genetically modified foods (Bovay & Alston, 2018). However, states have almost-unfettered power to develop new mandates or restrictions in the area of FAW. As shown in Figure 9, this authority has culminated in 19 state-level bills and ballot initiatives concerning FAW across 13 states through 2020 (Animal Agricultural Alliance, 2021). In light of the substantial negative economic effects of FAW regulations for agricultural producers and other stakeholders, a natural question emerges – can one empirically assess how and why these measures occur in US states' regulatory landscapes?

Figure 9: Timeline of All Enacted FAW Regulations 2000-2021
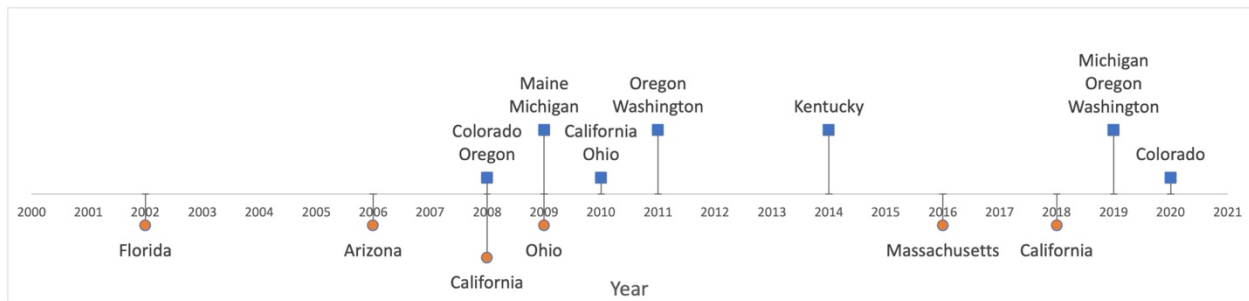
Note: Bills are above the horizontal axis, have square markers, and are blue in color; ballot initiatives are below the axis, have round markers, and are orange in color. The bills in Kentucky and Ohio were administrative regulations or revised statutes. Regulations occurring after 2020 were not included in this article's analysis due to limited data availability.

We seek to model the evolution of the state-level FAW regulatory landscape as a function of legislature characteristics and constituent demographics. More specifically, we utilize a two-stage model to assess (i) whether and when a given state considers FAW measures, and (ii) if so, the likelihood the measures are passed. Using this model, we estimate the likelihood of FAW adoption outcomes for all 50 states. Using these predictions, we then estimate the cost to the egg and pork industries to upgrade to cage- and crate-free production methods in the states most likely to pass a FAW regulation in the future. We believe this exercise will assist producers and industry stakeholders in gauging the future of the regulatory landscape and provide guidance on whether to upgrade existing enclosures to comply with mandates on the horizon or to continue operating with "conventional" enclosures.

Of course, we are not the first to attempt to understand the uptake of state-level farm regulation. Videras (2006) first analyzed whether religious demographic variables could be used to predict voting outcomes in the context of the 2002 Florida Animal Cruelty Amendment. Results showed that Catholicism and Evangelism had strong, conflicting effects on support for the FAW ballot initiative. Smithson et al. (2014) expanded on (Videras, 2006) by analyzing the demographic drivers of voting under the 2008 California Proposition 2 ballot initiative. The authors further created predictions for all 50 states to determine which states and animal agriculture industries have a high probability of future FAW regulations. Bovay and Alston (2016) develop a similar approach to model the probability of genetically modified organism (GMO) labeling restrictions across all 50 states based on California Proposition 37. Similarly, Bovay and Sumner (2019) used voting results from both California Proposition 2 and the Prevention of Farm Animal Cruelty Act in Massachusetts in 2016 to draw connections between political party affiliation and support for FAW initiatives.

However, one persistent puzzle in this line of research is that studies tend to over-predict state-level FAW regulation. Smithson et al. (2014), for example, predicted between 46% and 100% of all 50 US states would pass a FAW law through a ballot initiative, if such initiatives were considered. Similarly, Bovay and Sumner (2019) predicted that nearly all 50 states would have passed FAW regulations in the 2008 and 2016 election years. If FAW measures are so universally popular, why has this widespread adoption not already occurred?

We posit that this gap between the literature and reality is a function of inherent selection in whether and when states consider this type of regulation. In contrast to previous papers,[14] our model utilizes a two-stage, three-part process to account for potential selection bias between bills and ballot initiatives by state legislators. A large body of research in political science has established how the use of ballots versus bills functions in state legislature behavior (Matsusaka, 1992; Boehmke & Patty, 2007). Consider, for example, the different costs to legislators and citizen groups of voting on a proposed law. It is much cheaper for an interest group to lobby a handful of legislators than the population of a state, and so this is usually the first step (Matsusaka, 1992). For the legislators, costs are more complex: they must weigh their personal views, party views, and the views of their constituents before deciding to vote. Our specification allows us to consider the effect that legislative decisions have on the success of a proposed bill or ballot initiative, especially when using these models to forecast voting outcomes in other states.

2. Background

In the US, individual states can enact their own FAW laws and regulations, so long as these laws do not contradict laws passed by the federal government. This type of legislative process is similar to that exercised by members of the EU, in which some countries have chosen to enact

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[14] Previous papers include an earlier version of this work, Hopkins et al. (2020).

their own laws to regulate agricultural production that go beyond what is required by the EU. In the US, FAW legislation is passed at the state level through two major avenues: through a bill voted on in the legislature or through a ballot initiative voted on directly by citizens.

Since 2007, 11 FAW laws have been enacted through the legislative process. All but one US state has a bicameral legislative body, which is a two-body legislature made up of the State Senate and State House of Representatives.[15] The process to pass a legislative bill in the US involves several stages. Typically, one or more representatives drafts a bill to present to the legislative body that they reside in.[16] The bill will then be considered by smaller, more focused committees within the respective body, and if it passes in committee(s), it can be voted on by the entire body.[17] Once a bill passes by majority vote in either the House or Senate, it is sent to the other legislative body and goes through the entire process again. If it passes a vote in the second legislative body, it is then referred to the Governor of the state, who can either sign it into law or veto it.[18]

Ballot initiatives are an option to create laws in 24 of the 50 US states.[19] A ballot initiative is typically proposed by citizens of the state, an interest group, or some other non-governmental organization (NGO). Ballot initiatives in the US fall into two categories: direct and indirect ballot initiatives. Direct ballots bypass the legislature at every step of the ballot initiative process; that is, they do no not require approval or action by legislatures to be placed on a ballot, so long as a state's

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[15] Nebraska is the only state with a unicameral legislature, meaning it only has one legislative body.
[16] Representatives may draft legislation to support their own beliefs, the beliefs of their constituents, or in response to lobbying from interest groups.
[17] It is common that bills do not make it through committee or do not receive a vote on the floor of the Senate or House once through a committee.
[18] If there is two-thirds support of the vetoed law in both legislative bodies, vetoed laws can be passed into law without the Governor's signature, though this is rare.
[19] Each state has its own requirements and processes that must be followed before the initiative can be considered, and these requirements vary greatly across states; therefore, our empirical analysis cannot differentiate between direct versus indirect ballot initiatives.

signature and legal filing requirements have been met. On the other hand, indirect ballot initiatives must be approved by the state legislature before they can appear on a ballot. In either case, typically a subset of the state legislature, such as a Budget Committee, is involved in the ballot initiative process to the extent that they conduct a financial and legal analysis of the proposed law to present to the petitioners. Some states also require the legislature to hold formal hearings or an open forum about the initiative proposed. At any point in the direct or indirect ballot initiative process, the legislature can decide to pass a bill to enact the regulations proposed in the ballot initiative. Once an initiative is on a ballot, it is voted on by citizens and will become law if it passes with a majority of the vote.[20,21] Six FAW laws have been passed through ballot initiatives since 2002.

A list of the FAW bills and ballot initiatives analyzed in this article is given in Table 31. Of the laws enacted, 10 of them involve confinement standards for egg-laying hens or the sale of eggs from hens raised in battery cages, 11 involve confinement standards for gestating sows, and 11 involve confinement of veal calves. There were an additional two bills regulating the confinement of veal calves and gestating sows that were vetoed by the states' governors (MI 2019 and NJ 2013).

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[20] Some states have specific requirements for majority vote, such as a 60% super-majority or a majority of all ballots cast, even if a person declined to vote on the initiative.

[21] Once passed by majority vote, the outcome may need to be confirmed by the legislature before being passed into law and may still require the Governor's signature. However, this additional legislative confirmation process is normally more of a formality; once the citizens have expressed majority support for a ballot initiative, the law will be enacted.

Table 31: Farm Animal Welfare Legislative Bills and Ballot Initiatives Analyzed

Type	Title of Legislation	Year	State	Industry Affected
Ballot	Amendment 10 – HSUS Ballot Initiative: Gestating Sows	2002	FL	Pork
Ballot	Proposition 204	2006	AZ	Pork, Veal
Bill	Or. Rev. Stat. §600.150	2007	OR	Pork
Bill	SB 201	2008	CO	Pork, Veal
Ballot[D]	Proposition 2	2008	CA	Eggs, Pork, Veal
Bill	Mich. Comp. Laws. Ann. §287.746	2009	MI	Eggs, Pork, Veal
Ballot[D]	Amendment 2 – Livestock Care Standards Amendment	2009	OH	Veal
Bill	AB 1437	2010	CA	Eggs
Bill	SB 805 – Relating to egg-laying hens	2011	OR	Eggs
Bill	Wash. Rev. Code §69.25.065 and §69.25.107	2011	WA	Eggs
Bill	SB 2191	2012	RI	Pork, Veal
Bill*	SB 1921	2013	NJ	Pork
Ballot	Prevention of Farm Animal Cruelty Act	2016	MA	Eggs, Pork, Veal
Bill*	SB 660	2018	MI	Eggs, Pork
Bill	HB 7456 – Unlawful Confinement of a Covered Animal	2018	RI	Eggs, Pork, Veal
Ballot[D]	Proposition 12	2018	CA	Eggs, Pork, Veal
Bill	SB 174	2019	MI	Eggs
Bill	S.B. 1019	2019	OR	Eggs
Bill	HB 2049 – Concerning commercial egg layer operations	2019	WA	Eggs

* Represents a bill that passed but was vetoed by the state's governor. All other bills or ballots have been enacted. [D] Indicates a direct ballot initiative. All other ballot initiatives are indirect.

Relationships between demographic characteristics and support for FAW are well documented in agricultural economics and political science literature and are therefore important to consider when studying FAW regulation adoption. Smithson et al. (2014) found that an increase in median household income and an increase in poverty rate both correlated with a decrease in support for FAW regulations. Educational achievement has been shown to correlate with lower support for regulations to increase FAW, as more educated individuals are more likely to view animal and human similarities and differences more scientifically and this may change their views on FAW (Jerolmack, 2003).

Previous research suggests that religion plays a large role in an individual's view of the natural world and thus impacts views on animals and animal welfare (Videras, 2006). For instance,

Catholics tend to be more supportive of animal welfare issues than Protestants and Evangelicals (Smithson et al., 2014; Oldmixon, 2017). Overall, non-religious, non-Christians, and Catholics are most in favor of FAW over Christians (Cornish et al., 2016; Jerolmack, 2003; Flynn, 2001). Jerolmack (2003) found that Jewish and other religions were more likely to support animal rights. In Islam, concern for animal welfare and animal rights are key moral and religious values (Gharebaghi et al., 2007). Several studies have also shown that non-white Americans tend to view regulation to increase FAW more positively (Jerolmack, 2003; Franklin et al., 2001; Nibert, 1994; Peek et al., 1996; Uyeki & Holland, 2000). Over the past two decades, FAW has become an increasingly politicized issue in the US (Feindt et al., 2020; Lai et al., 2021; Vogeler, 2020). Membership in the Democratic party has been linked to higher concern for animal welfare in a wide variety of past studies and contexts, including McKendree et al. (2014), Deemer and Lobao (2011), Czech and Borkhataria (2001), Miele et al. (1993), and Heleski et al. (2006). Furthermore, from past studies using voter data, we know that liberals are more supportive of animal welfare measures, in general, than conservatives (Smithson et al., 2014).

3. Methodology

We utilize a two-stage, three-part multinomial endogenous switching regression (MESR) to model the implementation of FAW regulations and account for decision selection bias.[22,23] In

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[22] Selection bias is a common challenge in studies using nonrandomized data to model decisions and outcomes. Methodologically, most studies in this area have used propensity score matching (PSM); however, the PSM approach does not correct selection bias from unobserved factors (Abdulai, 2016; Jaleta et al., 2016). Unlike PSM, MESR models employ a selection correction method by calculating an Inverse Mills Ratio (IMR) using the theory of truncated normal distribution to correct selection bias (Bourguignon et al., 2007). The IMR is the ratio of the probability density function to the complementary cumulative distribution function of a distribution. This technique is commonly used in development economics to account for unobserved heterogeneity and selection bias in farmers' cropping decisions (Kassie et al., 2015; Di Falco, 2014).

[23] One method for adjusting for this bias may be Heckman's (Heckman, 1976) two-stage model; however, we must consider the different levels of data aggregation, inclusion of population weights, use of both panel and cross-sectional data sets, and likelihood of unobserved heterogeneity in our analysis. Thus, the Heckman approach would give inconsistent estimates if selection bias originating from observed and unobserved heterogeneity is not addressed.

the MESR framework, the two stages are modeled simultaneously. A simple schematic of our MESR model is depicted in Figure 10. We hypothesize the likely source of selection bias occurs at the state legislative level – legislatures may endogenously self-select different FAW legislative actions, and decisions are likely to be influenced by unobserved factors that may be correlated with outcome variables. Additionally, accounting for institutional characteristics is crucial to understanding the relationship between policy changes and politics, particularly in FAW where passing regulations using democratic instruments such as ballot initiatives is common (Vogeler, 2020). The MESR allows us to take into account the characteristics of individual states' governments and their impact on the likelihood of a FAW bill or ballot initiative occurring and passing. These relationships are modeled in Stage 1 (Legislature Action Decisions) of our model. We then account for decision selection bias in our second stage FAW regulation voting outcome models – Stage 2.1 (Ballot Initiative Voting Outcomes) and Stage 2.2 (Legislative Bill Voting Outcomes) by including the first-stage Inverse Mills Ratio (IMR) as an explanatory variable and bootstrapping to compute coefficient and standard error estimates.

3.1. Econometric Model

We discuss each of the components in turn.

Figure 10: Farm Animal Welfare Voting Two-Stage Selection Model Schematic
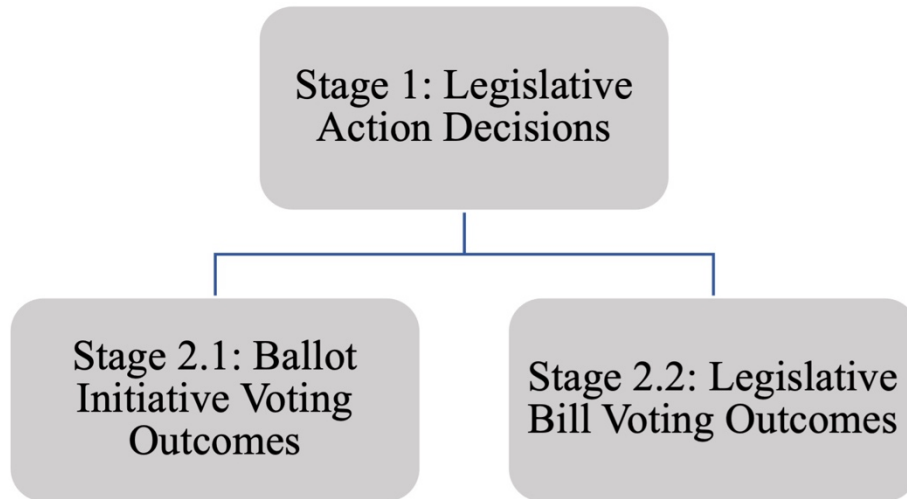
3.1.1 Stage 1: Legislative Action Decisions

Here, we model state legislatures' choice of alternative legislative actions for addressing FAW concerns – no action, bill proposed, or ballot initiative allowed – using a multinomial logit selection (MNLS) model accounting for unobserved heterogeneity (Equation 18). Stage 1 is aggregated at the state level and consists of 20 years of annual panel data for 49 of the 50 states (*n* = 980).[24] We cluster the standard errors by state. The dependent variable can take three values: y = 0 if no action was taken, $y = 1$ if a ballot initiative was placed on a ballot, or $y = 2$ if a bill was proposed to the state legislature.

We estimate the following first-stage model:

$$Y_i = \{0,1,2\} = (X_i' \times \beta) + (D_i' \times \delta) + (C_i' \times \kappa) + \varepsilon_i$$

Equation 18

where Y_i is the predicted action outcome of a state legislature, X_i is the matrix of state legislature political variables – dummy variables to indicate whether the state house, senate and governor are all of the same political party (denoted *TRIFECTA_D* and *TRIFECTA_R*), and continuous

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[24] Nebraska is excluded from this data set due to its unique unicameral state government system and because the state's legislators are not required to affiliate with a political party.

variables indicating the percent of house and senate seats occupied by Democrats (denoted *HOUSE%D* and *SENATE%D*) – with β the corresponding coefficients. D_i is the matrix of legislative characteristic variables – counts of previous animal welfare legislation (denoted *COUNT_PASSED_PREV*), a dummy variable indicating whether the state had previously passed FAW regulation (denoted *PREV_LAW*),[25] and a dummy variable indicating whether the state allows ballot initiatives (denoted *ALLOW_BALLOT*) – with δ the corresponding coefficients. C_i is the matrix of state agricultural industry density variables (denoted *HENS_PER_1000* and *HOGS_PER_1000*) which are the number of egg-laying hens and gestating sows per 1,000 people in each state, respectively – with κ the corresponding coefficients. ε_i is the error term.

The IMRs for each of the second stage regressions are then calculated (Equation 19 and Equation 20) from their respective estimated outcome probabilities in the MNLS model:

$$IMR_i = \frac{f(Y_i)}{\bar{F}(Y_i)}$$

Equation 19

$$\bar{F}(Y_i) = Pr(Y_i > y_i) = \int_{y_i}^{\infty} f(s)ds$$

Equation 20

where $i = 0,1,2$ for the no action, ballot, and bill outcomes, respectively, $f(Y_i)$ is the standard normal probability density function (PDF), $\bar{F}(Y_i)$ is the standard normal cumulative distribution function (CDF), and s is the integration argument.

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[25] *COUNT_PASSED_PREV* and *PREV_LAW* account for the "snowball effect" of previous laws. A "snowball effect" is a situation in which one event influences the likelihood that a similar event occurs (Matsusaka, 2005). These two variables also proxy for the diffusion of media coverage related to FAW within and between states, increased public awareness of FAW, and other time effects.

3.1.2. Stage 2: Ballot and Bill Voting Outcomes

In the second stage, we evaluate the voting outcomes for a ballot initiative (Stage 2.1) or a legislative bill (Stage 2.2) using ordinary least squares (OLS) with IMRs as additional covariates to account for selection bias from time-varying unobserved heterogeneity.

Stage 2.1 Ballot Initiative Voting Outcomes: In Stage 2.1, we model county-level voting outcomes for six ballot initiatives in Arizona (AZ; 2006), California (CA; 2008 & 2018), Florida (FL; 2002), Massachusetts (MA; 2016), and Ohio (OH; 2009) ($n = 299$). To model these voting outcomes, we estimate a log-linear model:

$$ln\left(\frac{V_k}{1 - V_k}\right) = (IMR'_k \times \phi) + (B'_k \times \zeta) + u_k$$

Equation 21

where the dependent variable is the log-odds of the predicted "yes" portion of the ballot initiative vote V_k. IMR_k is the IMR value from the Stage 1 ballot outcome with ϕ the corresponding coefficient.[26] B_k is the matrix of county demographics including people per farm (*PEOPLE_PER_FARM*),[27] percent of voters in the county who voted for the Democratic presidential candidate in the year closest to when the initiative was on the ballot (*%DEMOCRAT*), median household income in thousands of dollars (*HOUSEHOLD_INCOME_1000*), the percent of people in poverty (*POVERTY_RATE*), the percent of persons of 25+ years of age with a bachelor's degree (*EDUCATION*), the percent of white (*%WHITE*), Black (*%BLACK*), and Hispanic citizens (*%HISPANIC*), and the percent of Mainline Protestants (*%MAINLINE_PROTESTANT*), Evangelical Protestants (*%EVANGELICAL_PROTESTANT*),

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[26] A table showing the distribution of the Stage 1 ballot IMRs is given in Appendix A.4.
[27] This variable (*PEOPLE_PER_FARM*) is a proxy for citizens' familiarity with agriculture.

and Catholics (*%CATHOLIC*) – with ζ the corresponding coefficients.[28] There is little accurate

data available for Jewish and Muslim populations at the county level, and so we unfortunately do

not include these religions in our model.[29] u_k is the error term. Standard errors in the model are

clustered by state, as we are aggregating data from five different states.

Stage 2.2 Legislative Bill Voting Outcomes: In Stage 2.2, we model 13 individual bill voting

outcomes in California (CA; 2010), Colorado (CO; 2008), Michigan (MI; 2009, 2018 & 2019),

New Jersey (NJ; 2013), Oregon (OR; 2007, 2011 & 2019), Rhode Island (RI; 2012 & 2018), and

Washington (WA; 2011 & 2019) (n = 1,583). To estimate bill-voting outcomes, we use a linear

probability model (LPM) with continuous state legislative-district level demographic data to

predict the vote of individual legislators.[30] The dependent variable can take two values: $Z = 0$ if

the legislator voted "no", was absent, or declined to vote on an FAW bill, or $Z = 1$ if the legislator

voted "yes". We estimate the following model:

$$Z_j = \{0,1\} = \left(IMR_j' \times \tau\right) + \left(L_j' \times \gamma\right) + u_j$$

Equation 22

where Z_j is the actual vote of a given legislator. IMR_j is the vector of IMR values from the Stage

1 bill outcome with τ the corresponding coefficient. L_j is the matrix of state legislative district

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[28] These variables were selected to be consistent with previous literature on the relationships between demographic characteristics and FAW ballot initiative outcomes (Videras, 2006; Smithson et al., 2014; Bovay & Sumner, 2019), as well as documented correlations between demographics and support for FAW in general (McKendree et al., 2014; Jerolmack, 2003; Deemer & Lobao, 2011; Czech and Borkhataria, 2001; Miele et al., 1993; Heleski et al., 2006; Oldmixon, 2017).
[29] We collected county-level data from ARDA the Association of Religious Data Archives (http://www.thearda.com/QL2010/) for the percentage of Jewish and Muslim citizens for the bill and ballot states involved in our Stage 2 models. This data was very sparse, as these populations are small relative to the overall population of the US. Roughly 3/4 of the counties collected did not report a percentage estimate for Muslim citizens and about 2/3 did not report a percentage for Jewish citizens. We attempted to interpolate the data using fractional probit and OLS models; however, the results were poor. For example, the model predicted negative Jewish and Muslim population estimates for some counties, which is nonsensical.
[30] In order to use the MESR model with IMRs, the second-stage models must be linear, that is, a probit or logit function is not compatible. Further, an LPM is as appropriate as a logit or probit for this data so long as our standard errors are robust (Bellemare, 2015).

demographic variables. These variables are equivalent to those in Stage 2.1, except at the legislative district, rather than county, level.[31] Additionally, we include a dummy variable to indicate the political party of the legislator (denoted *DEMOCRAT*). Corresponding coefficients are represented by γ. u_j is the error term.

Stage 2 Bootstrapping and Standard-Error Clustering: To help with bias and inconsistency and improve inference in the IMR-adjusted second stage models, we bootstrap coefficients and standard errors using a stationary cluster block bootstrap method. This allows us to estimate coefficients simultaneously across the two stages of our model (Politis & White, 2004; Politis & Romano, 1994; Hall et al., 1995). Our block bootstrapping procedure randomly selects 45 states to use in our model and tests out-of-sample prediction accuracy using the five states randomly excluded in each repetition.[32]

3.2 Data by Stage

In this section, we describe our data selection and collection process, aggregation levels, and summary statistics by stage. More explicit information on how data were accessed and data sources are given in Appendix A.5.

The variable names, descriptions, and summary statistics for Stage 1 (Legislative Action Decisions) are included in Table 32. The majority of our data were collected from the respective

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[31] As above, these include people per farm (*PEOPLE_PER_FARM*), median household income (*HOUSEHOLD_INCOME_1000*), the percent of people in poverty (*POVERTY_RATE*), the percent of persons 25+ years of age with a bachelor's degree (*EDUCATION*), the percent of white (*%WHITE*), Black (*%BLACK*), and Hispanic citizens (*%HISPANIC*), and the percent of Mainline Protestants (*%MAINLINE_PROTESTANT*), Evangelical Protestants (*%EVANGELICAL_PROTESTANT*), and Catholics (*%CATHOLIC*). We selected the variables based on documented correlations between demographics and support for FAW (McKendree et al., 2014; Jerolmack, 2003; Deemer & Lobao, 2011; Czech & Borkhataria, 2001; Miele et al., 1993; Heleski et al., 2006; Oldmixon, 2017) and for comparison to the ballot model.

[32] We chose to bootstrap using blocks rather than only clustering by state, as only clustering standard errors by state in the Stage 1 MNLS model would likely lead to correlation between observations from the same state. We conducted 1,000 repetitions with 35, 40, and 45 states per block in Stage 1. Models were robust to block size and thus we chose the 45 block model.

state government websites and Ballotpedia.org. Agricultural industry data was collected from USDA QuickStats and the Livestock Marketing Information Center (LMIC).

Variable names, descriptions, and summary statistics for Stage 2.1 (Ballot Initiative Voting Outcomes) are given in Table 33. Counties with less than 2,000 people were dropped, then each county within a state was given a weight corresponding to the fraction of its population relative to the overall state population, minus any dropped counties.[33]

Variable names, descriptions, and summary statistics for Stage 2.2 (Legislative Bill Voting Outcomes) are given in Table 34. There is no need to weight this data, as legislative districts are drawn to be proportional based on the most recent census data.

The majority of the demographic data for Stage 2.1 and 2.2 were downloaded from the United States Census website (census.gov). Data were used from the census year closest to the year the ballot or bill was considered. Stage 2.1 data on vote outcomes were collected from each state's records, available online. Stage 2.2 data on legislators' individual votes was collected from each state legislature's records, available online. Farm data was collected from USDA QuickStats. All religion data were retrieved from the Association of Religious Data Archives.[34]

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[33] Weighting is important when evaluating demographic makeup, as weighting the data by county population ensures more realistic and accurate predictions. In the U.S., state-level elections are determined by a majority vote; therefore, relative populations should be considered when collecting the data. Our weighting procedure is similar to that used by Smithson et al. (2014). This weighting method is intuitive: if County A has two times the population of County B, then the demographic percentages and voting outcomes from County A will be given two times the importance of those from County B in the state-wide calculations.

[34] As religious data is not reported for all states by legislative district, religious affiliation data for legislative districts was obtained by aggregating and averaging the data from counties in the district.

Table 32: Variable Names and Descriptions for Stage 1 – Legislative Action Decisions

Variable Name	Description	Frequency (%)	Mean	Standard Deviation
Y_i, $i = 0,1,2$	Categorical variable = 0 if the state legislature took no action, = 1 if the state legislature allowed a ballot initiative, and = 2 if the state legislature proposed a legislative bill	$i = 0$, 95.61% $i = 1$, 0.92% $i = 2$, 3.47%		
HENS_PER_1000	Continuous variable equal to the number of egg-laying hens per 1,000 people in a state in a given year		1430.57	2474.54
HOGS_PER_1000	Continuous variable equal to the number of gestating sows per 1,000 people in a state in a given year		61.78	123.08
TRIFECTA_D	Dummy variable = 1 if all three bodies of state legislative branch are controlled by Democrats, = 0 otherwise		0.21	0.41
TRIFECTA_R	Dummy variable = 1 if all three bodies of state legislative branch are controlled by Republicans, = 0 otherwise		0.33	0.47
HOUSE%D	Continuous variable equal to the percent of the state's House of Representatives that belong to the Democratic Party		48.76	16.89
SENATE%D	Continuous variable equal to the percent of the state's Senate that belong to the Democratic Party		47.04	19.11
COUNT_PASSED_PREV	Discrete variable equal to the total number of farm animal welfare regulations in place throughout the US		8.60	7.55
PREV_LAW	Dummy variable = 1 if the state has a previous farm animal welfare law in place, = 0 otherwise		0.12	0.32
ALLOW_BALLOT	Dummy variable = 1 if the state allows ballot initiatives, = 0 otherwise		0.48	0.50

Table 33: Variable Names and Descriptions for Stage 2.1 – Ballot Voting Outcomes

Variable Name	Description	Mean	Standard Deviation
$ln\left(\dfrac{V_k}{1-V_k}\right)$	Log of the odds of success of the ballot initiative	0.31	0.65
PEOPLE_PER_FARM	Continuous variable equal to the number of people per farm in the county	1392.42	9326.10
HOUSEHOLD_INCOME_1000	Continuous variable equal to the median household income in the county in thousands of dollars	49.56	16.26
POVERTY_RATE	Continuous variable equal to the percent of people in the county who are below the poverty line	5.19	5.23
EDUCATION	Continuous variable equal to the percent of people in the county 25+ years old with a 4-year college degree	20.69	9.98
%WHITE	Continuous variable equal to the percent of people in the county who are white	71.99	21.01
%BLACK	Continuous variable equal to the percent of people in the county who are Black	5.92	7.44
%HISPANIC	Continuous variable equal to the percent of people in the county who are Hispanic	15.42	17.32
%DEMOCRAT	Continuous variable equal to the percent of voters in the county who voted for the Democratic presidential candidate in the presidential election year closest to when the initiative was on the ballot	47.42	12.06
%CATHOLIC	Continuous variable equal to the percent of people in the county who are Catholic	17.67	14.04
%EVANGELICAL_PROTESTANT	Continuous variable equal to the percent of people in the county who are Evangelical Protestants	12.87	8.89
%MAINLINE_PROTESTANT	Continuous variable equal to the percent of people in the county who are Mainline Protestants	6.52	4.99

Table 34: Variable Names and Descriptions for Stage 2.2 – Legislative Bill Voting Outcomes

Variable Name	Description	Mean	Standard Deviation
Z_j	Discrete variable = 1 if the legislator voted yes on a farm animal welfare bill, = 0 otherwise	0.80	0.40
PEOPLE_PER_FARM	Continuous variable equal to the number of people per farm in the legislative district	395.71	2358.62
HOUSEHOLD_INCOME_1000	Continuous variable equal to the median household income in the legislative district in thousands of dollars	60.57	18.43
POVERTY_RATE	Continuous variable equal to the percent of constituents in the legislative district who are below the poverty line	13.76	6.92
EDUCATION	Continuous variable equal to the percent of constituents in the legislative district 25+ years old with a 4-year college degree	30.98	14.01
%WHITE	Continuous variable equal to the percent of constituents in the legislative district who are white	80.81	16.94
%BLACK	Continuous variable equal to the percent of constituents in the legislative district who are Black	9.04	13.90
%HISPANIC	Continuous variable equal to the percent of constituents in the legislative district who are Hispanic	13.32	14.42
DEMOCRAT	Dummy variable = 1 if legislator belongs to the Democratic Party	0.59	0.49
%CATHOLIC	Continuous variable equal to the percent of constituents in the legislative district who are Catholic	21.20	13.47
%EVANGELICAL_PROTESTANT	Continuous variable equal to the percent of constituents in the legislative district who are Evangelical Protestants	10.05	4.77
%MAINLINE_PROTESTANT	Continuous variable equal to the percent of constituents in the legislative district who are Mainline Protestants	5.75	22.28

4. Results

We present the results of each stage of our model in turn.

4.1. Stage 1: Legislature Action Decisions

Results of the multinomial logit model for Stage 1 are in Table 35. with results for the ballot outcome on the left and bill outcome on the right. The base case is a legislature not taking any action on FAW regulations; that is, neither a bill nor ballot initiative is proposed. For ease of interpretation, Stage 1 model coefficients are given in relative risk ratio (RRR) format.[35] A value greater than one means the risk of the outcome falling in the comparison group rather than the base group increases as the variable increases. A RRR less than one means the risk of the outcome falling in the comparison group over the base group decreases as the variable increases. For example, the coefficient of 1.695 on *PREV_LAW* for the bill outcome means that a bill is 69.5% more likely to occur than no action, all else equal. Similarly, the coefficient of 0.281 on *TRIFECTA_R* in the ballot column means that a ballot is 71.9% [1.00 - 0.281 = 0.719] less likely to occur than no action, all else equal.

A state's ties to the pork and egg industries resulted in interesting impacts on the likelihood that a bill or ballot would be proposed over no action taken. The ratio of gestating sows and egg-laying hens to 1,000 people within the state, *HOGS_PER_1000* and *HENS_PER_1000*, have notable predicted influences. While the number of egg-laying hens per 1,000 people does not have a correlated effect on the likelihood a ballot or bill is proposed, the number of gestating sows per 1,000 people does. As the number of gestating sows per 1,000 people increases, we see a corresponding 5.2% decrease in the likelihood that a ballot is proposed and a 0.8% decrease in the likelihood that a bill is proposed. This implies that states with higher ratios of gestating sows to

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[35] A table with non-transformed coefficients is in Appendix A.4.

people are less likely to propose FAW regulations. This is sensible. States in which this ratio is higher likely have larger populations of people familiar with the pork industry, and this familiarity will influence the peoples' choice to regulate FAW in pork production. Further, state legislators in states with prominent agricultural industries likely have closer connections with local Farm Bureaus and other agricultural lobbyists. Introducing legislation that is counter to these groups' interests can have high political costs from the legislators' perspective.

The history of FAW regulations is also important. As the number of previous FAW laws in the nation overall rises (*COUNT_PASSED_PREV*), we see a correlation with an increase in the likelihood that either a ballot or a bill is proposed in any state, though this correlation is only significant in the bill case. These results support (Matsusaka, 2005) who asserts that there can be a bandwagon effect where legislation in one state leads to proposals of similar legislation in other states. When there is already a FAW law in place in a state (*PREV_LAW*), a bill is more likely to be proposed in a given state during a given year than no action taken. This association makes sense, as citizens of a state that already had a FAW regulation in place have likely been exposed to more media coverage of FAW issues. On the other hand, in states with a previous law, it is 51.5\% less likely that a ballot is proposed than no action taken. This makes sense as citizens are unlikely to feel the need to petition for a ballot initiative for another FAW law if FAW concerns have already been addressed. The option within a state to take action through a ballot initiative (*ALLOW_BALLOT*) correlates with an over 18-fold (19.391) increase in the likelihood that a ballot will be proposed in a given year than no action taken.

Interestingly, the influence of political party and legislative composition was more pronounced in the bill model. Our results show that the presence of a Democratic trifecta (*TRIFECTA_D*) is associated with a significant increase in the likelihood that a bill is proposed

and a decrease in the likelihood that a ballot is proposed. On the other hand, a Republican trifecta (*TRIFECTA_R*) correlates with a decrease in the chances of either a FAW bill or ballot, though the correlation is only significant in the case of a bill. As the percent of Democrats in the House (*HOUSE%D*) increases, we see an increase in the likelihood of proposing a bill or a ballot, though these effects are not statistically significant. These findings are in line with previous studies, which found that Democrats tend to support FAW more than Republicans (McKendree et al., 2014; Deemer and Lobao, 2011; Czech and Borkhataria, 2001; Miele et al., 1993; Heleski et al., 2006). On the other hand, as the percent of Democrats in the Senate increases (*SENATE%D*), we see a small associated decrease in the likelihood of a proposed bill or ballot. Finally, the constant terms in both the bill and ballot outcomes are very close to zero, meaning the probability of no action is almost 100% more likely than a bill or ballot. Our out-of-sample model predictions (the five states randomly excluded from the clustering in each of our 1,000 bootstrapping repetitions) are over 92% accurate.[36]

In Table 36 we present the predicted mean probability of the three outcomes in a given state for a given year from 2000 to 2019. We note that the mean predicted probability for no action in a state in each year is about 96%, going as low as about 49% and as high as nearly 100%. These predictions suggest that the FAW bills and ballots that are currently in place were unlikely to occur.

4.2. Stage 2.1: Ballot Initiative Voting Outcomes

The results of the OLS regression for the ballot initiative model in Stage 2.1 are given in Table 37 with the ballot model on the left in column (1). The dependent variable in the ballot

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[36] See Appendix A.4 for descriptive statistics on the accuracy of out-of-sample predictions.

regression is the log-odds of success of the initiative. The results of the model are contingent on a ballot being allowed and put to a vote.[37]

In our ballot model, all variables are statistically significant. We note first that *PEOPLE_PER_FARM*, *%DEMOCRAT*, *%WHITE*, *%BLACK*, and *%HISPANIC* are all positive, indicating that an increase in these variables is associated with an increase in the likelihood of a ballot initiative's success. These effects are in line with those in Smithson et al. (2014). On the other hand, an increase in the percent of adults with at least a 4-year degree (*EDUCATION*) and the percent of citizens living below the poverty line (*POVERTY_RATE*) both correlate to a statistically significant decrease on the success of a ballot initiative. The sign on *POVERTY_RATE* matches the models presented in Smithson et al. (2014). The negative association of increased education on support for FAW regulations is supported by Jerolmack (2003), who suggest that educated individuals are more likely to view animal and human similarities and differences more scientifically. Additionally, the positive sign on the coefficient for *HOUSEHOLD_INCOME_1000* indicates a predicted increase in support for FAW regulations as median household income increases – this makes sense, as households with higher income levels have more disposable income to spend on specialty products.

An increase in the percent of Catholic citizens (*%CATHOLIC*) suggests a slight decrease in the likelihood that a FAW ballot initiative succeeds, which is in line with previous findings (Smithson et al., 2014; Videras, 2006; Oldmixon, 2017). The signs of *%EVANGELICAL_PROTESTANT* and *%MAINLINE_PROTESTANT* are negative and positive, respectively. Our results for Evangelical Protestants align with results in previous papers (Smithson et al., 2014; Videras, 2006; Oldmixon, 2017). While our results for Mainline Protestants

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[37] K-density plots showing the distribution of the R-squared values, IMRs, and residuals for the ballot model are given in Appendix A.4. Additionally, descriptive statistics for the IMRs are given by year in Appendix A.4.

conflict with (Videras, 2006) and Smithson et al. (2014), we believe the inclusion of more data in our model, particularly from states with higher percentages of Mainline Protestants, allows for more robust estimates of the effects on support for FAW regulations of numbers of Mainline Protestants. The IMR values from Stage 1 (*BALLOT_IMR*) are statistically significant and positive. Thus, there exists a selection process that would bias results if not taken into account.[38] Finally, the constant term has a positive and significant value, suggesting that a ballot is likely to pass once considered.

Table 35: Stage 1 Legislature Action Decisions Output

VARIABLES	(1) Ballot Outcome	(2) Bill Outcome
HENS_PER_1000	1.000 (<0.001)	1.000 (<0.001)
HOGS_PER_1000	0.948** (0.024)	0.992** (0.003)
COUNT_PASSED_PREV	1.050 (0.045)	1.097*** (0.038)
PREV_LAW	0.485 (0.467)	1.695 (0.793)
ALLOW_BALLOT	19.391*** (21.053)	1.443 (0.617)
TRIFECTA_D	0.537 (0.312)	2.442* (1.233)
TRIFECTA_R	0.281 (0.328)	0.179* (0.159)
HOUSE%D	1.019 (0.042)	1.045 (0.034)
SENATE%D	0.995 (0.038)	0.987 (0.026)
CONSTANT	0.001*** (0.002)	0.002*** (0.002)
Observations	980	

Note: Robust standard error form in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Standard errors are given in relative risk ratio format.

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[38] An unadjusted ballot model, similar in structure to those estimated by Smithson et al. (2014) and Videras (2006) is included in Appendix A.4.

Table 36: Mean Predicted Probability of Stage 1 Legislative Action Decisions Outcomes

Predicted Outcome	Mean Prob.	Std. Dev.	Min. Prob.	Max. Prob.
No Action	0.95714	0.06766	0.47826	0.99940
Bill Proposed	0.03367	0.06342	0.00021	0.51945
Ballot Proposed	0.00918	0.01403	0.00014	0.09639

Note: 36 FAW bills were proposed between 2000 and 2019, but only 13 made it to a vote in a state legislature; the "Bill Proposed" outcome does reflect this full consideration rate.

Table 37: Stage 2.1 Ballot Initiative and Stage 2.2 Legislative Bill Voting Outcomes

Variables	(1) Ballot Model	(2) Bill Model
PEOPLE_PER_FARM	<0.001*** (<0.001)	<0.001*** (<0.001)
%DEMOCRAT	0.014*** (<0.001)	
DEMOCRAT		0.208*** (0.001)
%WHITE	0.008*** (<0.001)	<0.001*** (<0.001)
%BLACK	0.001*** (<0.001)	0.002*** (<0.001)
%HISPANIC	0.008*** (<0.001)	0.002*** (<0.001)
EDUCATION	-0.009*** (<0.001)	<0.001*** (<0.001)
POVERTY_RATE	-0.023*** (<0.001)	-0.006*** (<0.001)
HOUSEHOLD_INCOME_1000	0.002*** (<0.001)	-0.001*** (<0.001)
%CATHOLIC	-0.003*** (<0.001)	<0.001*** (<0.001)
%EVANGELICAL_PROTESTANT	-0.034*** (<0.001)	0.003*** (<0.001)
%MAINLINE_PROTESTANT	0.030*** (<0.001)	0.013*** (<0.001)
BALLOT_IMR	0.110*** (<0.001)	
BILL_IMR		0.009*** (<0.001)
CONSTANT	0.650*** (0.001)	0.678*** (0.004)
Observations	299	1,583

Note: Robust standard errors in parentheses. Coefficients and errors are obtained from cluster bootstrapping. *** p<0.01, ** p<0.05, * p<0.1. All variables in (1) are weighted by county population as a proportion of the total state population.

4.3. Stage 2.2: Legislative Bill Voting Outcomes

The results of the LPM regression for the legislative bill model in Stage 2.2 are given in Table 37 on the right in column (2). The dependent variable here is the vote of the legislator, with a value of 1 equating to a "yes" vote and a value of 0 otherwise. The results of this model are contingent on a bill being proposed and put to a vote.

An increase in the number of people per farm (*PEOPLE_PER_FARM*) correlates with a significant increase in the likelihood of a legislator voting "yes" on a FAW bill, though the magnitude of this coefficient is small. This implies that legislators from districts with relatively less representation and familiarity with agriculture are more likely to vote in support of FAW regulations. Legislators who identify as Democrats are significantly more likely to vote "yes" on an FAW regulation than to vote "no", as evidenced by the positive coefficient on *DEMOCRAT*. Again, this aligns with previous literature that Democrats are more likely to support FAW than Republicans (McKendree et al., 2014; Deemer & Lobao, 2011; Czech & Borkhataria, 2001; Miele et al., 1993; Heleski et al., 2006). Increases in the percent of white (*%WHITE*), Black (*%BLACK*), Hispanic (*%HISPANIC*), adults with at least a 4-year college degree (*EDUCATION*), Catholic (*%CATHOLIC*), Evangelical Protestant *(%EVANGELICAL_PROTESTANT*), and Mainline Protestant *(%MAINLINE_PROTESTANT*) constituents all correlate with an increased likelihood that a legislator votes "yes" on a FAW bill. However, all these effects are small. The positive signs on *EDUCATION*, *%CATHOLIC*, and *%EVANGELICAL_PROTESTANT* are opposite to the signs in the ballot model. Increases in the percent of constituents living below the poverty line (*POVERTY_RATE*) and the median household income (*HOUSEHOLD_INCOME_1000*) in the legislative district are associated with a decrease in the likelihood that a legislator votes "yes" on a FAW bill, but again, these effects are small. The negative correlation between increases in

HOUSEHOLD_INCOME_1000 and the likelihood that a legislator supports a FAW bill differs from the correlation found in the ballot model. The IMR values from Stage 1 are statistically significant, confirming the need to include the selection process from Stage 1. Additionally, the constant coefficient, which is statistically significant and positive, suggests that once a bill is put to a vote, it is more likely to pass than fail.

4.4. Ballot (Stage 2.1) and Bill (Stage 2.2) Model Comparisons

There are general differences in the importance and influence of demographics between the bill and ballot initiative models. The only demographic variable that has a meaningful magnitude associated with success of a FAW regulation in the bill model is the legislator's political party (*DEMOCRAT*). In the ballot initiative model, the demographic variables are all relatively similar in their overall magnitude and correlation to voting outcomes. When comparing these two models, we conclude that legislators tend to vote along party lines when it comes to FAW regulations. For ballot initiatives, constituents' preferences and demographic characteristics more directly impact the outcome of FAW regulation, and as such, we see that the effect of demographic variables are more influential on voting outcomes. Indeed, Tolbert and Smith (2006) find that policies that result from a popular vote are more likely to be representative of voter preferences than policies that result from legislative votes.

4.5. Ballot Model Predictions

To understand the implications of using a multi-stage model and accounting for the decision of whether or not a ballot goes before the people, we generate predictions for all 50 states for our novel IMR adjusted ballot model using data from 2019 (

Figure *11*). Accurate predictions are shaded in dark grey in

Figure *11*. We use the ballot model to predict outcomes, but count either a bill, administrative action, or a ballot as a pass in "reality". Since only 24 of the 50 states have a ballot process, we use the outcomes from our model as a prediction of the opinions of a state's population. Our predictions for the non-ballot states should be considered as indicators for public opinion towards FAW, which influence the likelihood of a legislature proposing a bill but do not indicate that a legislature will necessarily pass a law. These results are also presented in Table 51 in Appendix A.4. In reality, 24% of all 50 states and 41.7% of the 24 ballot initiative states have passed FAW regulations. With our ballot model we predict that 26% of all 50 states and 30.4% of the 24 ballot states would pass FAW regulations. The predicted pass rates given by our novel IMR adjusted model are close to the actual percentage of states with FAW regulations in place. Furthermore, our model is 74% and 75% accurate in predicting the presence of a FAW law in all 50 states and the 24 ballot states, respectively. These results show that the inclusion of legislature-level behavior in our multi-stage model is important to consider and yields predictions that are more consistent with actual FAW regulation outcomes.

Figure 11: Map of Ballot Model Predictions
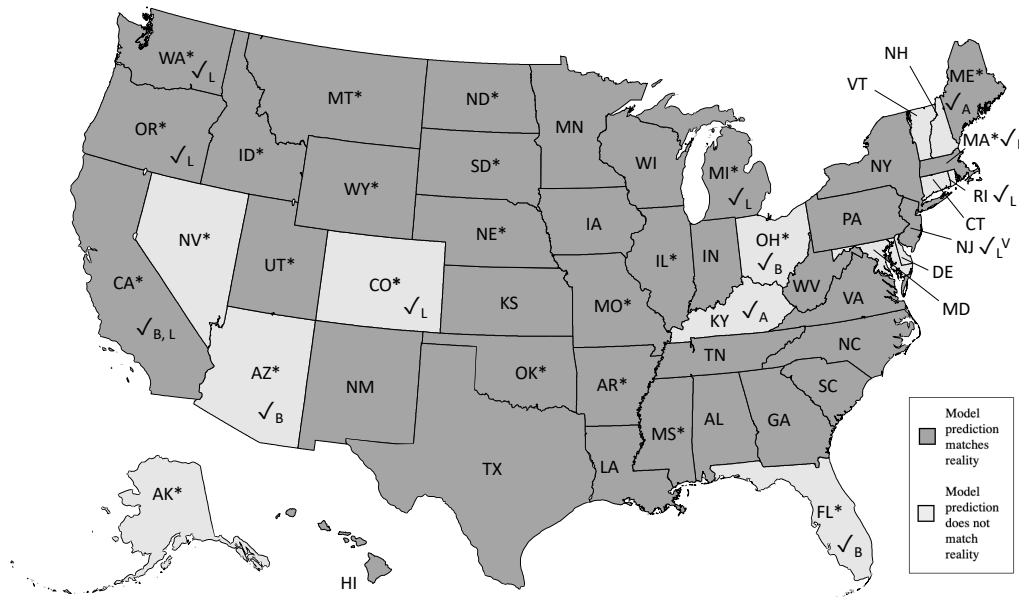
Note: States shaded in grey represent where the model prediction matches reality. States with a ($\checkmark$) have passed a FAW regulation as of 2019. The subscripts "A", "B", and "L" correspond to regulations passed through an administrative regulation, a ballot initiative, and a legislative bill, respectively. The superscript "V" denotes that the regulation was vetoed by the governor of the state and therefore is not in effect. States with a (*) allow ballot initiatives.

5. Implications

Predicting the outcome of future FAW regulations is important for several reasons. Producers, animal agriculture supply chain stakeholders, and consumers are all impacted by the outcomes of FAW regulations. In some cases, such as in California (CA) and Michigan (MI), FAW regulations also prohibit the import of products not produced in a manner that adheres to their state regulation(s). As such, consumers within a state with a FAW regulation can be precluded from purchasing these products, which negatively effects some consumers' welfare. These stakeholder effects could be seen in other instances of national, provincial, state, and local government regulations (such as in the EU) that go beyond what is required by the overarching government or organization.

The state-level regulatory process of the US is likely to remain the same in the future, with all states offering legislative bills and only 24 states allowing ballot initiatives as a means for passing new laws. As such, our predictions can assist producers and industry stakeholders in gauging the future of the regulatory landscape and provide guidance on whether to upgrade existing production methods to comply with anticipated mandates. Our model predicts where new FAW regulations are most likely to be passed; namely in the seven states that were predicted by our model to have a FAW law in place in 2019 but did not. These states are Alaska (AK), Connecticut (CT), Delaware (DE), Maryland (MD), Nevada (NV), New Hampshire (NH), and Vermont (VT). In Table 38 and Table 39, we present the predicted percentage of the population within these states that would be in favor of FAW regulations, the number of egg-laying hens and gestating sows in the state, the relative size of the state's industry to the national total, and the estimated costs to the industry in each of these states to update to cage-free egg and crate-free pork production methods. We assume that 18.32% of egg-laying hens and 18.67% of gestating sows are already in cage-free and crate-free housing systems.[39]

Table 38: Annual Cost to Update Cage-Free Egg Production in Seven States Predicted to Pass FAW Regulation

State	Percent of Population in Favor of FAW Regulation	Number of Egg-Laying Hens	Percent of Egg-Laying Hens in the Nation	Annual Cost to Update to Cage-Free System
Alaska*	57.224	8,360	0.002	$47,477.80
Connecticut	57.659	3,249,703	0.882	$18,455,593.01
Delaware	61.573	3,249,703	0.882	$18,455,593.01
Maryland	59.082	2,971,918	0.807	$16,878,005.68
Nevada	55.794	15,964	0.004	$90,662.15
New Hampshire	62.032	246,099	0.067	$1,397,636.25
Vermont	63.689	173,241	0.047	$983,863.82
Total	**N/A**	**9,914,988**	**2.69**	**$56,308,831.72**

Note: States with a (*) allow ballot initiatives. We assume a $6.95 increase in production cost per hen per year. Collar values have been inflated to 2022 dollars.

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[39] For a detailed explanation of how we calculated these numbers and the estimated costs to the other states without a FAW regulation in place, please see Appendix A.6.

Table 39: Annual Cost to Update to Crate-Free Pork Production in Seven States Predicted to Pass FAW Regulation

State	Percent of Population in Favor of FAW Regulation	Number of Gestating Sows	Percent of Gestating Sows in the Nation	Annual Cost to Update to Crate-Free System Lower Bound	Annual Cost to Update to Crate-Free System Upper Bound
Alaska*	57.224	400	0.003	$16,754.39	$28,534.83
Connecticut	57.659	600	0.005	$25,131.59	$42,802.24
Delaware	61.573	4,000	0.031	$167,543.93	$285,348.25
Maryland	59.082	3,700	0.029	$154,978.13	$263,947.13
Nevada	55.794	400	0.003	$16,754.39	$28,534.83
New Hampshire	62.032	600	0.005	$25,131.59	$42,802.24
Vermont	63.689	800	0.006	$33,508.79	$57,069.65
Total	**N/A**	**10,500**	**0.080**	**$439,802.81**	**$749,039.16**

Note: States with a (*) allow ballot initiatives. We assume an increase in production costs of $51.53 (lower bound) and $87.77 (upper bound) per sow per year. Dollar values have been inflated to 2022 dollars.

As seen in Table 38, these seven states make up almost 3% of national egg production. Matthews and Sumner (2015) estimate an annual increase of $6.95 per hen in 2022 dollars to update to a cage-free production method. The total estimated annual cost to update all seven states' egg industries to cage-free production methods is over $56.3 million annually. Likewise, in Table 39, these seven states make up less than 1% of national pork production. Ortega and Wolf (2018) estimate an annual increase of between $51.53 and $87.77 per sow in 2022 dollars to update to crate-free production methods. The estimated cost to update all seven states' pork industries to crate-free production is between $439.8 thousand and $749.1 thousand annually. These estimated values do not take into account any effects on interstate commerce. In the case that future FAW regulations impose restrictions on what products can be sold within a state, the predicted costs to consumers would be added to these estimates.

Outside of the US, the correlations we find between demographic variables and predicted public support for FAW regulations are likely transmutable. These associations can help inform policy makers and industry stakeholders of potential future FAW regulations in countries or organizations with similar legislative and regulatory processes to the US. Furthermore, we have provided a novel two-stage, three-part MESR analysis method to incorporate multiple stages of regulatory processes into predictions that can be applied to other legislative processes throughout the world. Additionally, an MESR model like the one presented here can be used to model the regulatory process for other types of agricultural policies and laws, such as laws related to regulating agricultural pollution.

Further, as affluence increases in developing countries worldwide, it is likely that there will be an increase in these consumers' activity in food system regulations in the future. Our results shed light on likely regulatory outcomes in these countries. Countries in which ballot initiatives or

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a similar process are allowed can anticipate citizens' voting behavior through analyzing demographic characteristics. On the other hand, countries in which laws are only passed through a legislature of elected representatives can anticipate that political party-line voting will occur.

6. Conclusion

Nineteen state-level bills and ballot initiatives concerning farm animal welfare (FAW) have been adopted across 12 states. In this research, we seek to model the evolution of the state-level FAW regulatory landscape as a function of legislature characteristics and constituent demographics. More specifically, we utilize a two-stage model to assess (i) whether and when a given state considers FAW measures, and (ii) if so, the likelihood the measures are passed. We find that state legislature characteristics influence the likelihood of taking FAW regulatory action differently between ballot initiatives and legislative bills. Moreover, political party has a stronger influence on the outcome of votes on legislative bills, while demographics have a stronger effect on the outcome of votes on ballot initiatives. Finally, we find that new FAW regulations are most likely to be passed in Alaska, Connecticut, Delaware, Maryland, Nevada, New Hampshire, and Vermont. We estimate the costs to the egg and pork industries to update to cage- and crate-free production systems in these states to be small.

Of course, our analysis is not without limitations. For example, our analysis necessarily reduces nuanced regulation into a binary outcome. However, not all FAW regulations are alike. Underlying "yes" or "no" outcomes we have modeled are distinct rules that may affect markets differently. We are unable to account for these differences in our specifications. Further, there are likely multiple factors leading to over-prediction in FAW regulation voting models, including the presence of social desirability bias (SDB) in public voting (Lai et al., 2021). Moreover, and perhaps most importantly, our analysis relies on an assumption that the future – both in terms of what

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policies are considered and how those considerations play out – is like the past. The US is constantly experiencing changes in discourse, policy environments, and business strategies at the firm level. These changes may impact the probabilities that FAW legislation is proposed and how it is voted on, so out of sample predictions in the future using our model may not be possible. To the extent that the COVID-19 pandemic, ongoing climate crisis, and other current issues take center stage in the policy arena, these considerations could "crowd out" agricultural policies, such as the farm animal welfare regulations considered in this analysis. This could reduce the ongoing external validity of our results. Despite these concerns, our model does provide a good indication of FAW support within each state and can serve as a tool for policy makers, industry members, and other associated groups to understand the FAW regulatory landscape and provide guidance on whether to upgrade existing enclosures to comply with mandates on the horizon or to continue operating with "conventional" enclosures.

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APPENDIX A.1 INTERVIEW PROCESS AND ANALYSIS OVERVIEW

   The interviews were audio or video recorded using Zoom or a recorder app, then transcribed within 24 hours of the interview – using an automated transcription service – and then I further cleaned and edited the transcripts for grammar and transcription errors. The analysis of the interview data took part in eight main stages, an expanded version of what is suggested as the typical structure of qualitative analysis by Miles, Huberman, and Saldaña (2020). Retailers and processors were analyzed separately, though the steps were identical. These stages are illustrated in Figure 1.

   I identified recurring themes, concepts, and motivations in the interviews and defined explicit major themes and concepts. Using these concepts and themes, I developed a concept map and the first round of subject codes following techniques and suggestions from Saldaña (2013). Then I reviewed the transcripts again, and refined the concept map and codes, to allow for the addition of new codes/themes or to condense codes/themes together. I applied each cycle of codes to the interviews until I was satisfied that the codes accurately captured the information needed for the next phase of data collection.
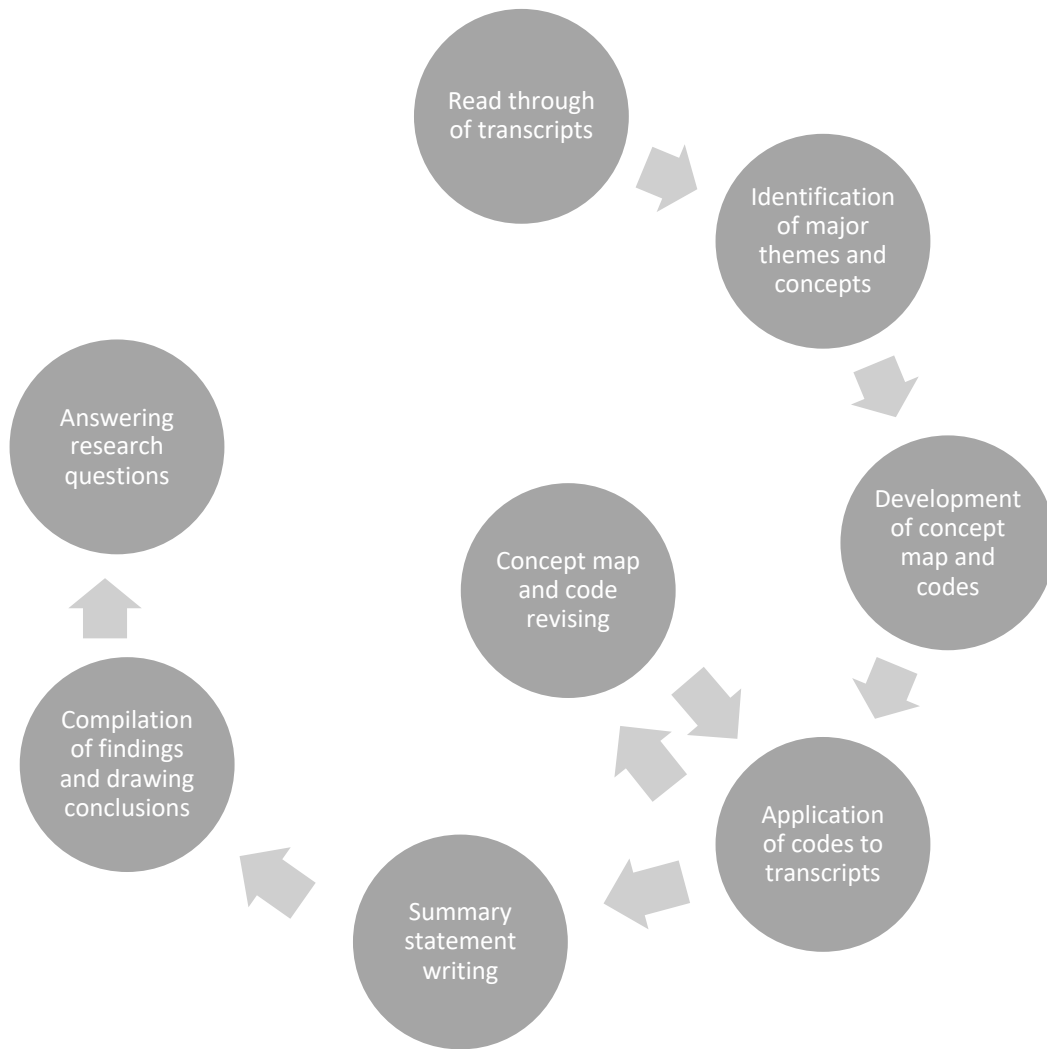
Figure 1: Stages of Qualitative Data Analysis

      For each interview transcript, a summary statement was composed for each of the codes. Then, these individual summaries were condensed into a single summary statement for each subject code to convey general interview findings. This technique is used in qualitative research to display data in an organized manner and see trends or gaps in information (Miles, Huberman, and Saldaña 2014). These summaries were used to draw conclusions and provide answers to the research questions and inform the design of the online survey. I intend to review all transcripts at least one additional time after the quantitative data is collected and analyzed; I think it is prudent to also review the transcripts through the lens of quantitative findings and potential interconnections and effects between the groups of interviewees rather than assuming each group operates in a vacuum.

APPENDIX A.2 PROCESSOR, RETAILER, AND CONSUMER SURVEY QUESTIONS

Meat Processor Survey

Q1 You are being asked to participate in a research study of meat and poultry slaughter and processing establishment preferences. Processing includes packing, freezing, canning, salting, smoking, and eviscerating meat products. You should feel free to ask the researchers any questions you may have. Your participation in this study will take about fifteen to twenty minutes. You will be asked to respond to a series of questions about how you make decisions at your establishment. There are 46 questions asking about your preferences for business practices in addition to questions asking about your establishment's operations. I also ask some basic demographic questions. This project will assist researchers to benchmark awareness of food-related issues and study events that could affect demand. You can choose to not complete the survey without penalty.

 Study Title: U.S. Meat Industry Overview: Consumer Preferences, Retailer Motivations, and Processor Practices Researcher Title and Contact Information: Melissa G.S. McKendree, PhD, mckend14@msu.edu and Kelsey Hopkins, PhD Candidate, hopki190@msu.edu, 847-513-1708 Department and Institution: Dept. of Agricultural, Food, and Resource Economics, Michigan State University Sponsor: USDA-Agriculture and Food Research Initiative

The researchers will not have access to your name or your establishment's name. At no point will a data file be constructed in which your personal information is linked with your responses. The data will only be released in summaries in which no individual's answers can be identified. You have the right to say no to participating in this research. You can stop at any time after you have started. There will be no consequences if you stop and you will not be criticized. You will not lose any benefits that you normally receive.

 If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury, please contact the researcher Melissa G.S. McKendree, 202 Morrill Hall of Agriculture, East Lansing, MI, 48824, mckend14@msu.edu. If you have questions about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 4000 Collins Rd, Suite 136, Lansing, MI 48910.

 Continuing with the survey means that you voluntarily agree to participate in this research study.

Q2 What type of establishment do you have?

Note: By definition, "processing" includes packing, freezing, canning, salting, smoking, and eviscerating/cutting meat products after slaughter.

- ○ Slaughter establishment (without further processing)
- ○ Processing establishment (without slaughter)
- ○ Slaughter and processing establishment
- ○ Distributor/storage facility
- ○ Other (e.g., custom butcher shop, on-farm custom exempt slaughter)
- ○ None of the above

Q3 Does your establishment slaughter or process **ONLY** pork, seafood, fish, and/or egg products?

- ○ Yes
- ○ No
- ○ Not applicable

Q4 To the best of your knowledge, which of these are requirements for a meat or poultry product to be ***halal***? Select all that apply.

- ☐ A blessing was spoken over the animal at the time of slaughter
- ☐ It is free of alcohol or alcohol derivatives
- ☐ The animal is slaughtered by a Muslim or Person of the Book (Jewish or Christian)
- ☐ The animal or meat product is imported from a Muslim majority country
- ☐ It is free of pork/porcine products or derivatives
- ☐ ⊗I am not sure/don't know

Q5 Has your establishment ever supplied ***halal*** meat or poultry products?

- ○ Yes, currently supplying halal meat/poultry products
- ○ Yes, supplied halal meat/poultry products in the past but not currently
- ○ No, never supplied halal meat/poultry products

Q6 Is your establishment certified for any other niche/specialty or value-added products (e.g., organic, kosher, antibiotic free, no added hormones, grass-fed, humanely raised, branded, etc.)?

- ○ No
- ○ Yes; please specify: _____

Q7 In what year did your establishment begin operations? _____

Q8 In what U.S. state is your establishment?

▼ Alabama ... I do not reside in the United States

Q9 Approximately how many people are employed at your establishment?_____

Q10 Approximately what percentage of your products are exported for international sale?

- ○ 0%
- ○ 1-25%
- ○ 26-50%
- ○ 51-75%
- ○ 75% or more
- ○ Not applicable/unsure

Q11 What type(s) of animal(s) do you slaughter/process at your establishment?

	Slaughter	Process	Neither Slaughter nor Process
Beef	☐	☐	☐
Veal	☐	☐	☐
Lamb or sheep	☐	☐	☐
Pork	☐	☐	☐
Turkey	☐	☐	☐
Chicken	☐	☐	☐
Goat	☐	☐	☐
Other (e.g., deer, bison, or exotic fowl)	☐	☐	☐

Q15 Please select the top three (3) motivations for your decision to supply ***halal*** meat or poultry products:

☐ My establishment has a ***halal*** program so I can sell our products at a premium price

☐ My establishment has a ***halal*** program so I can sell to more customers

☐ My establishment has a ***halal*** program so I can compete with other similar businesses with ***halal*** programs

☐ My establishment has a ***halal*** program so I can provide ***halal*** products for Muslim communities

☐ My establishment has a ***halal*** program so I can provide ***halal*** products for people with diverse cultural backgrounds

Q12 What type of ***halal*** meat or poultry does your establishment provide? (Select all that apply)

☐ Zabiha (hand-slaughtered) halal

☐ Machine-slaughtered halal

Q13 For your method of zabiha (hand-slaughtered) halal, is the cut to the animal's throat vertical or horizontal?

○ Vertical

○ Horizontal

○ I don't know/ I am not sure

Q14 How many years have you had a ***halal*** program at your establishment?

○ Less than 1 year

○ 1-3 years

○ 4-5 years

○ 6-10 years

○ 11-20 years

○ More than 20 years

○ Q94 Please indicate to what extent each of the following ***INCENTIVIZED*** you to start a ***halal*** program to your establishment:

	Not an incentive	Neutral	An incentive
Higher price for my products	○	○	○
Access to new markets to sell my products	○	○	○
Supplying niche religious products to minority communities	○	○	○
The ability to apply for grants or financial aid to help set up the program	○	○	○
Assistance from organizations (certifiers, universities, etc.) to coordinate setting up the halal program	○	○	○
Competing with similar businesses that had a halal program	○	○	○

Q93 Please indicate to what extent each of the following served as a ***BARRIER*** when you started a ***halal*** program to your establishment:

	Not a barrier	Neutral	A barrier
Costs associated with certification program involvement (certification fees, infrastructure, traceability technology materials, labor, etc.)	○	○	○
Religious or racial discrimination from regulating bodies	○	○	○
Backlash or displeasure from my non-Muslim customers	○	○	○
Lack of Muslim laborers available near me	○	○	○
Limited local market opportunities to sell my product	○	○	○
Lack of knowledge for how to implement a halal program at my operation	○	○	○

Display This Question:
 If Q2 = Slaughter establishment (without further processing)
 Or Q2 = Slaughter and processing establishment
 Or Q2 = Other (e.g., custom butcher shop, on-farm custom exempt slaughter)

Q16 Approximately what percent of your establishment's total **slaughter** is ***halal***?
- ○ Less than 10%
- ○ 11-25%
- ○ 26 - 50%
- ○ 51-75%
- ○ More than 75%
- ○ Not applicable

Display This Question:
 If Q2 = Processing establishment (without slaughter)
 Or Q2 = Slaughter and processing establishment
 Or Q2 = Other (e.g., custom butcher shop, on-farm custom exempt slaughter)

Q17 Approximately what percent of your establishment's total **processing** is ***halal***?
- ○ Less than 10%
- ○ 11-25%
- ○ 26-50%
- ○ 51-75%
- ○ More than 75%

   o Not applicable

Q18 Approximately what percentage of your **_halal_** products are exported for international sale?

   o 0%
   o 1-25%
   o 26-50%
   o 51-75%
   o 75% or more
   o Not applicable/unsure

Q19 Why does your establishment not export **_halal_** meat or poultry products for international sale? Select all that apply.

   ☐ Our **_halal_** certification program does not support exports
   ☐ I do not know how to coordinate exporting our **_halal_** products
   ☐ I do not have excess **_halal_** product available for export
   ☐ I do not want to export our **_halal_** products
   ☐ Other; please specify: _____

Q20 Is your operation certified by a third party to provide halal meat or poultry products?

   o Yes
   o No
   o I am not sure

Q21 Which organization(s) provides your **_halal_** certification? Select all that apply.

	Current certifier	Past certifier	Never been my certifier
Islamic Services of America (ISA)	☐	☐	☐
Halal Food Standards Alliance of America (HFSAA)	☐	☐	☐
Halal Monitoring Services (HMS)	☐	☐	☐
Halal Transactions of Omaha (HTO)	☐	☐	☐
Other; please specify:	☐	☐	☐

Q22 Approximately what percent of your establishment's total <u>processing</u> was **_halal_**?

   o Less than 10%
   o 11-25%
   o 26-50%
   o 51-75%
   o More than 75%
   o Not applicable

Q23 Approximately what percent of your establishment's total <u>slaughter</u> was ***<u>halal</u>***?
- ○ Less than 10%
- ○ 11-25%
- ○ 26-50%
- ○ 51-75%
- ○ More than 75%
- ○ Not applicable

Q24 Approximately what percentage of your ***<u>halal</u>*** meat or poultry products were exported for international sale?
- ○ 0%
- ○ 1-25%
- ○ 26-50%
- ○ 51-75%
- ○ 75% or more
- ○ Not applicable/unsure

Q25 What type of ***<u>halal</u>*** meat or poultry did your establishment provide? (Select all that apply)
- ☐ Zabiha (hand-slaughtered) halal
- ☐ Machine-slaughtered halal

Q26 For your method of zabiha (hand-slaughtered) halal, was the cut to the animal's throat vertical or horizontal?
- ○ Vertical
- ○ Horizontal
- ○ I don't know/ I am not sure

Q27 Please select the top three (3) motivations for your decision to supply ***<u>halal</u>*** meat or poultry products in the past:
- ☐ My establishment had a ***<u>halal</u>*** program so I could sell our products at a premium price
- ☐ My establishment had a ***<u>halal</u>*** program so I could sell to more customers
- ☐ My establishment had a ***<u>halal</u>*** program so I could compete with other similar businesses with ***<u>halal</u>*** programs
- ☐ My establishment had a ***<u>halal</u>*** program so I could provide ***<u>halal</u>*** products for Muslim communities
- ☐ My establishment had a ***<u>halal</u>*** program so I could provide ***<u>halal</u>*** products for people with diverse cultural backgrounds

Q28 How many years did you have a ***<u>halal</u>*** program at your establishment?
- ○ Less than 1 year
- ○ 1-3 years
- ○ 4-5 years
- ○ 6-10 years
- ○ 11-20 years
- ○ More than 20 years

Q29 Was your operation certified by a third party to provide ***<u>halal</u>*** meat or poultry products?
- ○ Yes
- ○ No

- o I am not sure

Q30 Why did you end your **_halal_** certification? (Check all that apply)
- ☐ Costs became prohibitive
- ☐ Wanted to offer different products
- ☐ Standards were too strict/hard to meet
- ☐ Poor working relationship with certifier
- ☐ Insufficient demand for halal products
- ☐ Other; please specify: _____

Q31 Which organization(s) was your **_halal_** certification from? Select all that apply.
- ☐ Islamic Services of America (ISA)
- ☐ Halal Food Standards Alliance of America (HFSAA)
- ☐ Halal Monitoring Services (HMS)
- ☐ Halal Transactions of Omaha (HTO)
- ☐ Other; please specify: _____

Q32 Have you ever considered adding a **_halal_** program to your establishment again?
- o Yes
- o No

Q33 Please indicate how likely each of the following are to **_INCENTIVIZE_** you to add a **_halal_** program back to your establishment:

	Unlikely	Neutral	Likely
Higher price for my products	○	○	○
Access to new markets to sell my products	○	○	○
Supplying niche religious products to minority communities	○	○	○
The ability to apply for grants or financial aid to help set up the program	○	○	○
Assistance from organizations (certifiers, universities, etc.) to coordinate setting up the halal program	○	○	○
Competing with similar businesses that had a halal program	○	○	○

Q34 Please indicate how likely each of the following serve as a **_BARRIER_** in your decision to add a **_halal_** program back to your establishment:

	Unlikely	Neutral	Likely
Costs associated with certification program involvement (certification fees, infrastructure, traceability technology materials, labor, etc.)	○	○	○
Religious or racial discrimination from regulating bodies	○	○	○
Backlash or displeasure from my non-Muslim customers	○	○	○
Lack of Muslim laborers available near me	○	○	○
Limited local market opportunities to sell my product	○	○	○
Lack of knowledge for how to implement a halal program at my operation	○	○	○

Q35 Have you ever considered adding a **_halal_** program to your establishment?
- ○ Yes
- ○ No
- ○ I do/did not know what halal is

Q36 Are you interested in learning more about **_halal_** meat production opportunities for your establishment?
- ○ Yes
- ○ No

Q37 Please indicate how likely each of the following are to **_INCENTIVIZE_** you to add a **_halal_** program to your establishment:

	Unlikely	Neutral	Likely
Higher price for my products	○	○	○
Access to new markets to sell my products	○	○	○
Supplying niche religious products to minority communities	○	○	○
The ability to apply for grants or financial aid to help set up the program	○	○	○
Assistance from organizations (certifiers, universities, etc.) to coordinate setting up the halal program	○	○	○
Competing with similar businesses that had a halal program	○	○	○

Q38 Please indicate how likely each of the following serve as a **_BARRIER_** in your decision to add a **_halal_** program to your establishment:

	Unlikely	Neutral	Likely
Costs associated with certification program involvement (certification fees, infrastructure, traceability technology materials, labor, etc.)	○	○	○
Religious or racial discrimination from regulating bodies	○	○	○
Backlash or displeasure from my non-Muslim customers	○	○	○
Lack of Muslim laborers available near me	○	○	○
Limited local market opportunities to sell my product	○	○	○
Lack of knowledge for how to implement a halal program at my operation	○	○	○

Q39 There is not a NHMC program in the U.S. I am interested in your opinions to help design a future national U.S. meat and poultry **_halal_** certification program. If you do not currently have a **_halal_** program, imagine that you are considering adding a **_halal_** program to your establishment.

In the following section of the survey, you will be presented seven scenarios. Please consider the

three factors presented, and indicate which one factor is the least important and which one is the most important to you when designing a national U.S. _**halal**_ meat and poultry certification program. Please select one factor as least important _**AND**_ one factor as most important in each question.

The questions look similar but contain different comparisons of factors. Please treat each question individually.

To help, I have given an example below with ice cream, where flavor is the most important factor and price is the least important factor in your decision to buy ice cream.
EXAMPLE
Of the following three factors, which one is the least important and which one is the most important in your decision to buy ice cream?

Q40 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. _**halal**_ meat and poultry certification program?

Least Important _(Check only one)_		Most Important _(Check only one)_
○	⊗**Which group(s) will enforce the program** (e.g., government, religious organization, private non-religious organization)	○
○	⊗**What will be required to be certified** (e.g., products, retailers, slaughter and processing establishments)	○
○	⊗**What halal standards will be required** (e.g., hand versus machine slaughter, stunned or not stunned)	○

Q41 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. _**halal**_ meat and poultry certification program?

Least Important _(Check only one)_		Most Important _(Check only one)_
○	⊗**Which group(s) will enforce the program** (e.g., government, religious organization, private non-religious organization)	○
○	⊗**Inspection process** (e.g., frequency, random or scheduled)	○
○	⊗**Benefits associated with certification program involvement** (e.g., access to new markets, price premiums)	○

Q42 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. _**halal**_ meat and poultry certification program?

Least Important (Check only one)		Most Important (Check only one)
○	⊗**Costs associated with certification program involvement** (e.g., certification fees, infrastructure, traceability technology materials, labor)	○
○	⊗**Which group(s) will enforce the program** (e.g., government, religious organization, private non-religious organization)	○
○	⊗**What information will be passed on to my customers and how they access it** (e.g., only available through the Freedom of Information Act (FOIA) versus accessible online)	○

Q43 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. _**halal**_ meat and poultry certification program?

Least Important (Check only one)		Most Important (Check only one)
○	⊗**What information will be passed on to my customers and how they access it** (e.g., only available through the Freedom of Information Act (FOIA) versus accessible online)	○
○	⊗**Inspection process** (e.g., frequency, random or scheduled)	○
○	⊗**What halal standards will be required** (e.g., hand versus machine slaughter, stunned or not stunned)	○

Q44 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. _**halal**_ meat and poultry certification program?

Least Important (Check only one)		Most Important (Check only one)
○	⊗**Benefits associated with certification program involvement** (e.g., access to new markets, price premiums)	○
○	⊗**What halal standards will be required** (e.g., hand versus machine slaughter, stunned or not stunned)	○
○	⊗**Costs associated with certification program involvement** (e.g., certification fees, infrastructure, traceability technology materials, labor)	○

Q45 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. _**halal**_ meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	⊗**Costs associated with certification program** (e.g., facility modifications, traceability equipment, certification fees, labor)	○
○	⊗**What will be required to be certified** (e.g., products, retailers, slaughter and processing establishments)	○
○	⊗**Inspection process** (e.g., frequency, random or scheduled)	○

Q46 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. _**halal**_ meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
	⊗**What information will be passed on to my customers and how they access it** (e.g., only available through the Freedom of Information Act (FOIA) versus accessible online)	
	⊗**Benefits associated with certification program involvement** (e.g., access to new markets, price premiums)	
	⊗**What will be required to be certified** (e.g., products, retailers, slaughter and processing establishments)	

Q47 If you were to use a ***national halal certification*** at your establishment, would you want it to be internationally accredited or recognized for export?

- ○ Yes
- ○ No
- ○ Maybe
- ○ I would not want to use a national ***halal*** certification at my establishment

Q48 Should individual products or supply chain members be required to have a ***national halal certification*** to ensure authentic ***halal*** meat and poultry products?

- ○ Individual products
- ○ Supply chain members (e.g., processor, wholesaler, retailer)
- ○ Both individual products and supply chain members

Display This Question:
  If Q48 = Supply chain members (e.g., processor, wholesaler, retailer)
  Or Q48 = Both individual products and supply chain members

Q49 Which members of the supply chain should be required to have a ***national halal certification***? Select all that apply.

- ☐ Slaughter establishments
- ☐ Processing establishments
- ☐ Distributors or transportation services
- ☐ Retailers and wholesalers
- ☐ Restaurants and food service
- ☐ Other; please specify: _____

Q50 Under a ***national halal certification***, how should a certified business be inspected?

- ○ Pre-scheduled inspections
- ○ Random/surprise inspections
- ○ A mixture of pre-scheduled and random inspections
- ○ Other; please specify: _____

Q51 Which benefits of a ***national halal certification*** would be most important to your business? Select up to three.

- ☐ Access to new domestic (U.S.) markets
- ☐ Access to new export (international) markets
- ☐ Ability to charge a higher price for my products
- ☐ Increased consumer trust
- ☐ Ease of identifying a certified product
- ☐ Ease of communicating product attributes
- ☐ Other; please specify: _____
- ☐ ⊗None of the above

Q52 Which costs of a ***national halal certification*** would be most important to your business? Select up to three.

- ☐ Reoccurring certification fees
- ☐ Cost of establishment modifications
- ☐ Increased labor hours needed
- ☐ Cost of traceability and/or verification equipment
- ☐ Other; please specify: _____

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- ☐ ⊗None of the above

Q53 In your opinion, what standards should be included in a ***national halal certification*** for meat and poultry? Select all that apply.
- ☐ Zabiha (hand-slaughter)
- ☐ Machine-slaughter
- ☐ Slaughterers of Muslim faith
- ☐ Slaughterers of Christian or Jewish faith
- ☐ Individual spoken blessings
- ☐ Animal(s) not stunned
- ☐ Animal(s) face Mecca at time of slaughter
- ☐ GMO-free
- ☐ Other; please specify: _____
- ☐ ⊗I don't know

Q54 Please indicate which parties **should** have access to the names of establishment(s) at which a ***halal*** meat or poultry product was slaughtered and/or processed using a ***national halal certification***. Select all that apply.
- ☐ General public
- ☐ Processors/slaughterers
- ☐ Wholesaler/distributor
- ☐ Retailers/restaurants
- ☐ Government organizations
- ☐ ⊗None of the above

Q55 Please indicate which parties **should** have access to a national list of ***halal*** certified meat/poultry establishments certified with a ***national halal certification***. Select all that apply.
- ☐ General public
- ☐ Processors/slaughterers
- ☐ Wholesalers/distributors
- ☐ Retailers/restaurants
- ☐ Government organizations
- ☐ ⊗None of the above

Q56 Please indicate which parties **should** have access to the name(s) of enforcement agencies that certify ***halal*** establishments with a ***national halal certification***. Select all that apply.
- ☐ General public
- ☐ Processors/slaughterers
- ☐ Wholesalers/distributors
- ☐ Retailers/restaurants
- ☐ Government organizations
- ☐ ⊗None of the above

Q57 Please indicate which parties **should** have access to information regarding the ***halal*** standards used in slaughter and/or processing under a ***national halal certification***. Select all that apply.
- ☐ General public
- ☐ Processors/slaughterers

- ☐ Wholesalers/distributors
- ☐ Retailers/restaurants
- ☐ Government organizations
- ☐ ⊗None of the above

Q58 How should the general public be able to access information related to a ***national halal certification*** program for meat/poultry? Select all that apply.
- ☐ Online (e.g., company website, online database)
- ☐ Using a QR code/cell phone app
- ☐ Freedom of Information Act (FOIA) request
- ☐ Other; please specify: _____

Q59 Who should ***set*** standards for a new ***national halal certification*** for meat and poultry? Select all that apply.
 Note: The U.S. and state governments are not legally allowed to define standards related to religious products.
- ☐ Non-government organizations
- ☐ Religious organizations
- ☐ Certifier-led organizations
- ☐ Producer-led organizations
- ☐ Wholesalers/distributors
- ☐ Slaughterers/processors
- ☐ Retailers/restaurants
- ☐ Other; please specify: _____

Q60 Who should ***enforce*** a new ***national halal certification*** for meat and poultry? Select all that apply.
- ☐ U.S. government organization (e.g., the USDA)
- ☐ State government organization (e.g., state department of agriculture)
- ☐ Non-government organizations
- ☐ Religious organizations
- ☐ Certifier-led organizations
- ☐ Producer-led organizations
- ☐ Slaughterers/processors
- ☐ Wholesalers/distributors
- ☐ Retailers/restaurants
- ☐ Other; please specify: _____

Q61 Please select the degree to which you agree or disagree with the following statements:

	Agree	Neutral	Disagree
Halal meat or poultry tastes better than ***non-halal*** meat or poultry	○	○	○
All ***halal*** meat or poultry slaughter or processing establishments must be ***halal*** certified	○	○	○
Halal establishments that are certified have a stronger reputation than ***halal*** establishments that are not certified	○	○	○
Halal meat/poultry is more sanitary than ***non-halal*** meat/poultry	○	○	○
The ***halal*** slaughter process is more humane for the animal	○	○	○
Establishments that are not ***halal*** certified cannot be trusted to supply authentic ***halal*** products	○	○	○
Halal meat and poultry is higher quality than ***non-halal*** meat and poultry	○	○	○
Halal meat and poultry is healthier than ***non-halal*** meat and poultry	○	○	○
If an establishment has a good reputation for supplying ***halal*** meat and poultry products, it does not need to be certified as ***halal***	○	○	○

Q62 What is your role or job at your establishment? _____

Q63 What is your current age?
- ○ 18-24 years old
- ○ 25-34 years old
- ○ 35-44 years old
- ○ 45-54 years old
- ○ 55-64 years old
- ○ 65-74 years old
- ○ 75 years or older
- ○ Prefer not to disclose

Q64 Were you born in the U.S.?
- ○ Yes
- ○ No, I was born in this country: _____
- ○ Prefer not to disclose

Q65 Were your parents and grandparents born in the U.S.?
- ○ Yes
- ○ No; they were born in this/these countries:_____
- ○ Prefer not to disclose

Display This Question:
   If Q64 = No, I was born in this country:
   Or Were you born in the U.S.? Text Response Is Not Empty

Q66 How long have you lived in the U.S.?
- ○ 0-5 years
- ○ 6-10 years
- ○ 11-15 years
- ○ 16-20 years
- ○ 21-25 years

- Over 25 years
- Prefer not to disclose

Q67 What is your gender?
- Male
- Female
- Prefer to self-describe: _____
- Prefer not to disclose

Q68 What is the highest level of education you have completed?
- Less than High School
- High school graduate or GED
- Some college
- 2-year degree (Associates)
- 4-year degree (BA, BS)
- Professional degree (JD, MD, PhD, etc.)
- Prefer not to disclose

Q69 Are you of Hispanic, Latino, or Spanish origin?
- No
- Yes; please specify: _____
- Prefer not to disclose

Q70 What is your race? Select all that apply.
- ☐ White
- ☐ Black or African American
- ☐ Native American or Alaska Native
- ☐ Native Hawaiian or Pacific Islander
- ☐ Asian
- ☐ Other; please specify: _____
- ☐ ⊗Prefer not to disclose

Q71 Which political party do you most identify with?
- Democrat
- Republican
- I am an independent
- Other; please specify: _____
- Prefer to not disclose

Q72 Which best describes the area in which you live?
- Rural
- Suburban
- Urban
- Prefer not to disclose

Q73 Do you consider yourself to be religious?
- No
- Yes, I am: _____
- Prefer not to disclose

Q74 Have you followed a religion in the past even if you do not do so now?
- No

    ○   Yes, I was: _____

    ○   Prefer not to disclose

Q75 Do you have any final thoughts or comments you wish to share about using/not using a ***halal*** meat program at your establishment?

_____

_____

Meat Retailer Survey

Q1 You are being asked to participate in a research study of meat and poultry retailers. You should feel free to ask the researchers any questions you may have. Your participation in this study will take about fifteen to twenty minutes. You will be asked to respond to a series of questions about how you make decisions at your retail establishment. There are questions asking about your preferences for business practices in addition to questions asking about your store's operations. I also ask some basic demographic questions. This project will assist researchers to benchmark awareness of food-related issues and study events that could affect demand. You can choose to not complete the survey without penalty.

Study Title: U.S. Meat Industry Overview: Consumer Preferences, Retailer Motivations, and Processor Practices
Researcher Title and Contact Information: Melissa G.S. McKendree, PhD, mckend14@msu.edu and Kelsey Hopkins, PhD Candidate, hopki190@msu.edu, 847-513-1708
Department and Institution: Dept. of Agricultural, Food, and Resource Economics, Michigan State University
Sponsor: USDA-Agriculture and Food Research Initiative

At no point will a data file be constructed in which your personal information is linked with your responses. The data will only be released in summaries in which no individual's answers can be identified. You have the right to say no to participating in this research. You can stop at any time after you have started. There will be no consequences if you stop, and you will not be criticized. You will not lose any benefits that you normally receive.

If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury, please contact the researcher Melissa G.S. McKendree, 202 Morrill Hall of Agriculture, East Lansing, MI, 48824, mckend14@msu.edu. If you have questions about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 4000 Collins Rd, Suite 136, Lansing, MI 48910.

Continuing with the survey means that you voluntarily agree to participate in this research study.

Please certify that you are over 18 years of age and agree to voluntarily participate in this survey.

- ○ I am over 18 and agree to participate
- ○ I am not over 18 or do not agree to participate

Q144 Please ensure you are carefully reading through the survey questions and making thoughtful selections in order to qualify for the $25 survey incentive. Any nonsense answers, quality issues, or speeding will be disqualified without incentive.

- ○ Agree
- ○ Disagree

Q2 Do you represent (work for or own) a retail store that sells meat or poultry products?

- ○ No
- ○ Yes

Q3 What is your role or job at your store?_____

Q4 Which of the following best describes your store?

- ○ Supermarket (e.g., Walmart, Target, Meijer)
- ○ Club membership store (e.g., Costco, Sam's Club)
- ○ Grocery store (e.g., independent small local or regional store)
- ○ Convenience store
- ○ Butcher shop/deli
- ○ Other, please specify: _____
- ○ None of the above

Q5 To the best of your knowledge, which of these are requirements for a meat or poultry product to be ***halal***? Select all that apply.

- ☐ A blessing was spoken over the animal at the time of slaughter
- ☐ It is free of alcohol or alcohol derivatives
- ☐ The animal is slaughtered by a Muslim or Person of the Book (Jewish or Christian)
- ☐ The animal or meat product is imported from a Muslim majority country
- ☐ It is free of pork/porcine products or derivatives
- ☐ ⊗I am not sure/don't know

Q6 Has your retail store ever sold ***halal*** meat or poultry products?

- ○ Yes, currently selling halal meat/poultry products
- ○ Yes, sold halal meat/poultry products in the past but not currently
- ○ No, never sold halal meat/poultry products
- ○ I am unsure/don't know

Q7 Does your retail store sell any other certified niche/specialty or value-added ***meat or poultry products*** besides halal (e.g., organic, kosher, antibiotic free, no added hormones, grass-fed, humanely raised, branded)?

- ○ No, no other specialty meat or poultry products
- ○ Yes, I sell other specialty meat or poultry products. Please specify: _____

Q8 **The following questions ask for basic information about your retail store. If you are responsible for multiple retail stores, please answer the questions based on your primary or flagship retail location.**

Q9 In what year did your store begin operations? Please enter a full year, such as 1990. _____

Q10 In what U.S. state is your store?

▼ Alabama ... My store is not in the United States

Q11 In what type of area is your store located?
- ○ Rural or countryside
- ○ Suburban or small-mid size city
- ○ Urban or large city
- ○ Prefer not to disclose

Q12 Approximately how many people are employed at your store full time or full time equivalent? *Note: For example, if an employee works 20 hours per week, they are considered 0.5 full time equivalent.*

_____

Q13 The following questions ask you about the meat and poultry products you sell in your store.

Q14 Where or how do you sell ***meat or poultry products*** at your store? Select all that apply.
- ○ Products are sold prepackaged on shelves *(shelf stable products)*
- ○ Products are sold prepackaged in a refrigerated or frozen display case *(case ready)*
- ○ Products are sold prepackaged in a refrigerated or frozen display case *(not case ready/cut in store)* Products are sold at a service deli counter
- ○ Products are sold at a service butcher counter
- ○ Other location or method. Please specify: _____

Q15 What species and types of ***meat or poultry products*** do you sell at your store?

	Fresh whole muscle cuts or ground (e.g., chicken breasts, roasts, ground turkey)	**Frozen** whole muscle cuts or ground (e.g., chicken breasts, roasts, ground turkey)	Frozen fully cooked	Ready to eat products (e.g., snack sticks, jerky)	Deli meats/ poultry	Canned, smoked, or cured meat/poultry products	I do not sell products from this species at my store
Beef	☐	☐	☐	☐	☐	☐	☐
Veal	☐	☐	☐	☐	☐	☐	☐
Lamb or sheep	☐	☐	☐	☐	☐	☐	☐
Pork	☐	☐	☐	☐	☐	☐	☐
Turkey	☐	☐	☐	☐	☐	☐	☐
Chicken	☐	☐	☐	☐	☐	☐	☐
Goat	☐	☐	☐	☐	☐	☐	☐
Other (e.g., deer, bison, camel, or exotic fowl)	☐	☐	☐	☐	☐	☐	☐

Q16 How many years have ***halal*** meat/poultry products been sold at your store?
- ○ Less than 1 year
- ○ 1-3 years
- ○ 4-5 years
- ○ 6-10 years
- ○ 11-20 years
- ○ More than 20 years

Q17 Approximately what percent of your store's **total meat/poultry sales** are ***halal***?
- ○ Less than 10%
- ○ 11-25%
- ○ 26 - 50%
- ○ 51-75%
- ○ More than 75%

Q18 What standard of ***halal*** meat or poultry does your store sell? Select all that apply.
- ☐ Zabiha (hand-slaughtered) halal
- ☐ Machine-slaughtered halal
- ☐ ⊗I am not sure/don't know

Display This Question:

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Q19 For your zabiha (hand-slaughtered) **_halal_** products, is the cut to the animal's throat vertical or horizontal?

- ○ Vertical (up and down)
- ○ Horizontal (ear to ear)
- ○ I don't know/ I am not sure

Q20 What **_halal_** meat or poultry products do you sell at your store? Select all that apply.

- ☐ **Fresh** whole muscle cuts or ground (e.g., chicken breasts, roasts, ground turkey)
- ☐ **Frozen** whole muscle cuts or ground (e.g., chicken breasts, roasts, ground turkey)
- ☐ Frozen fully cooked products
- ☐ Ready to eat shelf stable products (e.g., snack sticks, jerky)
- ☐ Deli meats/poultry
- ☐ Canned, smoked, or cured meats/poultry
- ☐ Other. Please specify: _____

Q21 What types of **_halal fresh whole muscle cuts_** do you sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q22 What types of **_halal frozen whole muscle cuts_** do you sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q23 What types of **_halal frozen fully cooked products_** do you sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal

- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q24 What types of ***halal ready to eat (shelf stable) products*** do you sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q25 What types of ***halal deli products*** do you sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q26 What types of ***halal canned, smoked, or cured products*** do you sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q27 What types of ***halal*** ${Q20/ChoiceTextEntryValue/7} ***products*** do you sell at your store? Select all that apply.

- ☐ Beef

- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q28 Would you like to sell other ___*halal*___ meat or poultry products at your store that you do not currently offer?
- ○ Yes. Please specify other halal meat or poultry products you would like to sell: _____
- ○ No

Q29 Please select the top three (3) motivations for your decision to sell ___*halal*___ meat/poultry products:
- ☐ My store offers ___*halal*___ meat/poultry products so I can sell these products at a higher retail margin
- ☐ My store offers ___*halal*___ meat/poultry products so I can attract more customers
- ☐ My store offers ___*halal*___ meat/poultry products so I can compete with other similar businesses that offer ___*halal*___ meat/poultry products
- ☐ My store offers ___*halal*___ meat/poultry products so I can provide ___*halal*___ meat/poultry products for Muslim communities
- ☐ My store offers ___*halal*___ meat/poultry products so I can provide ___*halal*___ meat/poultry products for people with diverse cultural backgrounds

Q30 Are any of the ___*halal*___ **products** your establishment provides certified by a third party? (e.g., individual products have a stamp or label that says "halal")
- ○ Yes
- ○ No
- ○ I am not sure

Q31 Is your **store** certified by a third party to provide ___*halal*___ meat or poultry products?
- ○ Yes
- ○ No
- ○ I am not sure

Q32 Which organization(s) provides your **store's** ___*halal*___ certification? Select all that apply.

	Current certifier	Past certifier	Never been my certifier
Islamic Services of America (ISA)	☐	☐	☐
Halal Food Standards Alliance of America (HFSAA)	☐	☐	☐
Halal Monitoring Services (HMS)	☐	☐	☐
Halal Transactions of Omaha (HTO)	☐	☐	☐
The Islamic Society of the Washington Area (ISWA)	☐	☐	☐
Other. Please specify:	☐	☐	☐

Q33 Which organization(s) provides your **products'** ___*halal*___ certification? Select all that apply.

	Current certifier	Past certifier	Never been my certifier	Unsure if they have ever been my certifier
Islamic Services of America (ISA)	☐	☐	☐	☐
Halal Food Standards Alliance of America (HFSAA)	☐	☐	☐	☐
Halal Monitoring Services (HMS)	☐	☐	☐	☐
Halal Transactions of Omaha (HTO)	☐	☐	☐	☐
The Islamic Society of the Washington Area (ISWA)	☐	☐	☐	☐
Other. Please specify:	☐	☐	☐	☐

Q34 Please indicate to what extent each of the following ***MOTIVATED*** your store to start a ***halal*** program:

	Not a motivation	Neutral	A motivation
Higher retail margin for ***halal*** products	○	○	○
Access to new customers to sell ***halal*** products	○	○	○
Supplying niche religious products to minority communities	○	○	○
The ability to compete with other similar businesses that offer ***halal*** meat/poultry products	○	○	○
Assistance from organizations (certifiers, producer groups, etc.) to coordinate finding a supplier	○	○	○

Q35 Please indicate to what extent each of the following was a ***CHALLENGE*** when you started a ***halal*** program to your store:

	Not a challenge	Neutral	A challenge
Costs associated with certification program involvement (certification fees, infrastructure, traceability technology materials, labor, etc.)	○	○	○
Religious or racial discrimination from regulating bodies	○	○	○
Backlash or displeasure from my non-Muslim customers	○	○	○
Limited local customer base to sell ***halal*** products	○	○	○
Lack of knowledge for how to sell ***halal*** products at my store	○	○	○

Display This Question:
    If Q35 = Costs associated with certification program involvement (certification fees, infrastructure, traceability technology materials, labor, etc.) [Neutral]
    Or Q35 = Costs associated with certification program involvement (certification fees, infrastructure, traceability technology materials, labor, etc.) [A challenge]

Q36 In the previous question, you indicated that costs were a challenge or barrier when beginning your halal program. Which of the following costs were the most challenging? Select all that apply.

    ☐ Reoccurring certification fees

- ☐ One-time infrastructure costs (e.g., additional refrigerators or shelves)
- ☐ Increased labor
- ☐ Traceability technology costs
- ☐ Other. Please specify: _____

Q37 How many years did you sell _**halal**_ meat/poultry products at your store?
- ○ Less than 1 year
- ○ 1-3 years
- ○ 4-5 years
- ○ 6-10 years
- ○ 11-20 years
- ○ More than 20 years

Q38 Approximately what percent of your store's total **meat/poultry sales** were _**halal**_?
- ○ Less than 10%
- ○ 11-25%
- ○ 26-50%
- ○ 51-75%
- ○ More than 75%

Q39 What standard of _**halal**_ meat or poultry products did your store sell? Select all that apply.
- ☐ Zabiha (hand-slaughtered) halal
- ☐ Machine-slaughtered halal
- ☐ ⊗I don't know/am not sure

Q40 For your zabiha (hand-slaughtered) _**halal**_ products, was the cut to the animal's throat vertical or horizontal?
- ○ Vertical (up and down)
- ○ Horizontal (ear to ear)
- ○ I don't know/ I am not sure

Q41 What _**halal**_ meat or poultry products did you sell at your store? Select all that apply.
- ☐ **Fresh** whole muscle cuts or ground (e.g., chicken breasts, roasts, ground turkey)
- ☐ **Frozen** whole muscle cuts or ground (e.g., chicken breasts, roasts, ground turkey)
- ☐ Frozen fully cooked products
- ☐ Ready to eat shelf stable products (e.g., snack sticks, jerky)
- ☐ Deli meats/poultry
- ☐ Canned, smoked, or cured meats/poultry
- ☐ Other. Please specify: _____

Q42 What types of _**halal fresh whole muscle cuts**_ did you sell at your store? Select all that apply.
- ☐ Beef
- ☐ Veal
- ☐ Lamb

- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify:

Q43 What types of ***halal frozen whole muscle cuts*** did you sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q44 What types of ***halal frozen fully cooked products*** did you sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q45 What types of ***halal ready to eat (shelf stable) products*** did you sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q46 What types of ***halal deli products*** did you sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal

- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q47 What species of ***halal canned, smoked, or cured products*** did you sell at your store? Select all that apply.
- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q48 What species of ***halal*** ${Q41/ChoiceTextEntryValue/7} ***products*** did you sell at your store? Select all that apply.
- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q49 Please select the top three (3) motivations for your decision to sell ***halal*** meat/poultry products:
- ☐ My store offered ***halal*** meat/poultry products so I could sell those products at a higher retail margin
- ☐ My store offered ***halal*** meat/poultry products so I could attract more customers
- ☐ My store offered ***halal*** meat/poultry products so I could compete with other similar businesses that offered ***halal*** meat/poultry products
- ☐ My store offered ***halal*** meat/poultry products so I could provide ***halal*** meat/poultry products for Muslim communities
- ☐ My store offered ***halal*** meat/poultry products so I could provide ***halal*** meat/poultry products for people with diverse cultural backgrounds

Q50 Why did you stop offering ***halal***? (Check all that apply)
- ☐ Costs became prohibitive
- ☐ Wanted to offer different products
- ☐ Standards were too strict/hard to meet

☐ Poor working relationship with certifier
☐ Insufficient demand for **_halal_** meat/poultry products
☐ Insufficient supply of **_halal_** meat/poultry products
☐ Other. Please specify: _____

Q51 Were any of your **_halal_** meat/poultry **products** certified by a third party?
○ Yes
○ No
○ I am not sure

Q52 Was your **store** certified by a third party to provide **_halal_** meat or poultry products?
○ Yes
○ No
○ I am not sure

Q53 Which organization(s) was your **store's _halal_** certification from? Select all that apply.
☐ Islamic Services of America (ISA)
☐ Halal Food Standards Alliance of America (HFSAA)
☐ Halal Monitoring Services (HMS)
☐ Halal Transactions of Omaha (HTO)
☐ The Islamic Society of the Washington Area (ISWA)
☐ Other. Please specify: _____
☐ ⊗Unsure/don't know

Q54 Which organization(s) were your **products' _halal_** certification from? Select all that apply.
☐ Islamic Services of America (ISA)
☐ Halal Food Standards Alliance of America (HFSAA)
☐ Halal Monitoring Services (HMS)
☐ Halal Transactions of Omaha (HTO)
☐ The Islamic Society of the Washington Area (ISWA)
☐ Other. Please specify: _____
☐ ⊗Unsure/don't know

Q55 Have you ever considered selling **_halal_** meat/poultry products at your store again?
○ Yes
○ No

Q56 Please indicate how likely each of the following are to **_MOTIVATE_** you to
sell **_halal_** meat/poultry products at your store again:

	Unlikely	Neutral	Likely
Higher retail margin for *halal* products	○	○	○
Access to new customers to sell *halal* products	○	○	○
Supplying niche religious products to minority communities	○	○	○
The ability to compete with other similar businesses that offer *halal* meat/poultry products	○	○	○
Assistance from organizations (certifiers, producer groups, etc.) to coordinate finding a supplier	○	○	○

Q57 Please indicate how likely each of the following would be a **CHALLENGE** if you were to sell *halal* meat/poultry products at your store again:

	Unlikely	Neutral	Likely
Costs associated with certification program involvement (certification fees, infrastructure, traceability technology materials, labor, etc.)	○	○	○
Religious or racial discrimination from regulating bodies	○	○	○
Backlash or displeasure from my non-Muslim customers	○	○	○
Limited local customer base to sell *halal* products	○	○	○
Lack of knowledge for how to sell *halal* products at my store	○	○	○

Q58 In the previous question, you indicated that costs would be a challenge or barrier when starting a halal program at your store again. Which of the following costs would be the most challenging? Select all that apply.

☐ Reoccurring certification fees
☐ One-time infrastructure costs (e.g., additional refrigerators or shelves)
☐ Increased labor
☐ Traceability technology costs
☐ Other. Please specify: _____

Q59 Have you ever considered selling *halal* meat/poultry products at your store?

○ Yes
○ No
○ I do/did not know what halal is

Q60 Are you interested in learning more about *halal* meat/poultry retail opportunities for your store?

○ Yes
○ No

Q61 What *halal* meat or poultry products would you like to sell at your store? Select all that apply.

- ☐ **Fresh** whole muscle cuts or ground (e.g., chicken breasts, roasts, ground turkey)
- ☐ **Frozen** whole muscle cuts or ground (e.g., chicken breasts, roasts, ground turkey)
- ☐ Frozen fully cooked products
- ☐ Ready to eat shelf stable products (e.g., snack sticks, jerky)
- ☐ Deli meats/poultry
- ☐ Canned, smoked, or cured meats/poultry
- ☐ Other. Please specify:

Q62 What types of ***halal fresh whole muscle cuts*** would you like to sell at your store? Select all that apply.
- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q63 What types of ***halal frozen whole muscle cuts*** would you like to sell at your store? Select all that apply.
- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q64 What types of ***halal frozen fully cooked products*** would you like to sell at your store? Select all that apply.
- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q65 What types of ***halal ready to eat (shelf stable) products*** would you like to sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify:

Q66 What types of ***halal deli products*** would you like to sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q67 What species of ***halal canned, smoked, or cured products*** would you like to sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q68 What species of ***halal*** ${Q61/ChoiceTextEntryValue/7} ***products*** would you like to sell at your store? Select all that apply.

- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q69 Please indicate how likely each of the following are to **_MOTIVATE_** you to sell **_halal_** meat or poultry products at your store:

	Unlikely	Neutral	Likely
Higher retail margin for **_halal_** products	○	○	○
Access to new customers to sell **_halal_** products	○	○	○
Supplying niche religious products to minority communities	○	○	○
The ability to compete with other similar businesses that offer **_halal_** meat/poultry products	○	○	○
Assistance from organizations (certifiers, producer groups, etc.) to coordinate finding a supplier	○	○	○

Q70 Please indicate how likely each of the following serve as a **_CHALLENGE_** in your decision to sell **_halal_** meat or poultry products at your store:

	Unlikely	Neutral	Likely
Costs associated with certification program involvement (certification fees, infrastructure, traceability technology materials, labor, etc.)	○	○	○
Religious or racial discrimination from regulating bodies	○	○	○
Backlash or displeasure from my non-Muslim customers	○	○	○
Limited local customer bases to sell **_halal_** products	○	○	○
Lack of knowledge for how to sell **_halal_** products at my store	○	○	○

Display This Question:
*   If Q70 = Costs associated with certification program involvement (certification fees, infrastructure, traceability technology materials, labor, etc.) [Neutral]*
*   Or Q70 = Costs associated with certification program involvement (certification fees, infrastructure, traceability technology materials, labor, etc.) [Likely]*

Q71 In the previous question, you indicated that costs would be a challenge or barrier when starting a halal program at your store. Which of the following costs would be the most challenging? Select all that apply.

☐ Reoccurring certification fees
☐ One-time infrastructure costs (e.g., additional refrigerators or shelves)
☐ Increased labor
☐ Traceability technology costs
☐ Other. Please specify: _____

Q146 The following question is to verify that you are paying attention. Please select the animal that has hooves from the options below.
○ Cat
○ Horse
○ Dog
○ Hamster

Skip To: End of Survey If Q146 != Horse

Q72 There is not a NHMC program in the U.S. I am interested in your opinions to help design a future national U.S. meat and poultry **_halal_** certification program. If you do not currently sell **_halal_** meat or poultry products, imagine that you are considering selling **_halal_** meat or

poultry products at your store.

In the following section of the survey, you will be presented seven scenarios. Please consider the three factors presented, and indicate which one factor is the least important and which one is the most important to you when designing a national U.S. *__halal__* meat and poultry certification program. Please select one factor as least important *__AND__* one factor as most important in each question.

The questions look similar but contain different comparisons of factors. Please treat each question individually.

To help, I have given an example below with ice cream, where flavor is the most important factor and price is the least important factor in your decision to buy ice cream.
EXAMPLE
Of the following three factors, which one is the least important and which one is the most important in your decision to buy ice cream?

Please click the arrow to continue.

Q73 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. *__halal__* meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	⊗**Which group(s) will enforce the program** (e.g., government, religious organization, private non-religious organization)	○
○	⊗**What will be required to be certified** (e.g., products, retailers, slaughter and processing establishments)	○
○	⊗**What halal standards will be required** (e.g., hand versus machine slaughter, stunned or not stunned)	○

Q74 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. *__halal__* meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	⊗**Which group(s) will enforce the program** (e.g., government, religious organization, private non-religious organization)	○
○	⊗**Inspection process** (e.g., frequency, random or scheduled)	○
○	⊗**Benefits associated with certification program involvement** (e.g., access to new markets, higher retail margin, increased consumer trust)	○

Q75 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. *__halal__* meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	⊗**Costs associated with certification program involvement** (e.g., certification fees, infrastructure, traceability technology materials, labor)	○
○	⊗**Which group(s) will enforce the program** (e.g., government, religious organization, private non-religious organization)	○
○	⊗**What information will be passed on to my customers and how they access it** (e.g., only available through the Freedom of Information Act (FOIA) versus accessible online)	○

Q76 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. *__halal__* meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	⊗**What information will be passed on to my customers and how they access it** (e.g., only available through the Freedom of Information Act (FOIA) versus accessible online)	○
○	⊗**Inspection process** (e.g., frequency, random or scheduled)	○
○	⊗**What halal standards will be required** (e.g., hand versus machine slaughter, stunned or not stunned)	○

Q77 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. _**halal**_ meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	⊗**Benefits associated with certification program involvement** (e.g., access to new markets, higher retail margin, increased consumer trust)	○
○	⊗**What halal standards will be required** (e.g., hand versus machine slaughter, stunned or not stunned)	○
○	⊗**Costs associated with certification program involvement** (e.g., certification fees, infrastructure, traceability technology materials, labor)	○

Q78 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. _**halal**_ meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	⊗**Costs associated with certification program** (e.g., facility modifications, traceability equipment, certification fees, labor)	○
○	⊗**What will be required to be certified** (e.g., products, retailers, slaughter and processing establishments)	○
○	⊗**Inspection process** (e.g., frequency, random or scheduled)	○

Q79 Of the following three factors, which one is the least important and which one is the most important to consider when designing a national U.S. _**halal**_ meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
	⊗**What information will be passed on to my customers and how they access it** (e.g., only available through the Freedom of Information Act (FOIA) versus accessible online)	
	⊗**Benefits associated with certification program involvement** (e.g., access to new markets, higher retail margin, increased consumer trust)	
	⊗**What will be required to be certified** (e.g., products, retailers, slaughter and processing establishments)	

Q80 If there were a ***national halal certification***, should individual products or supply chain members be required to have a certification to ensure authentic ***halal*** meat and poultry products?

- ○ Individual products
- ○ Supply chain members (e.g., processor, wholesaler, retailer)
- ○ Both individual products and supply chain members

Q81 Which members of the supply chain should be required to have a ***national halal certification*** for their establishment? Select all that apply.

- ☐ Slaughter establishments
- ☐ Processing establishments
- ☐ Distributors or transportation services
- ☐ Retailers and wholesalers
- ☐ Restaurants and food service
- ☐ Other. Please specify: _____

Q82 Under a ***national halal certification***, how should a certified ***business*** be inspected?

- ○ Pre-scheduled inspections
- ○ Random/surprise inspections
- ○ A mixture of pre-scheduled and random inspections
- ○ Other. Please specify: _____

Q83 Under a ***national halal certification***, how should a certified meat or poultry ***product*** be verified or traced? Select all that apply.

- ☐ Paper trail/certificates
- ☐ Online universal internet or cloud-based system (e.g., blockchain, RFID)
- ☐ Online store-specific system (e.g., store records)
- ☐ Laboratory tests to ensure no pork DNA
- ☐ Government audits
- ☐ Third party certifier audits (non-government)
- ☐ Other. Please specify: _____

Q84 Which benefits of a ***national halal certification*** would be most important to your business? Select all that apply.

- ☐ Access to new markets
- ☐ Ability to receive a higher retail margin for my products
- ☐ Increased consumer trust
- ☐ Ease of identifying a certified product
- ☐ Ease of communicating product attributes
- ☐ Other. Please specify: _____

Q85 Which costs of a ***national halal certification*** would be most important to your business? Select all that apply.

- ☐ Reoccurring certification fees

- ☐ Cost of establishment modifications (e.g., more shelves/coolers)
- ☐ Increased labor hours needed
- ☐ Cost of traceability and/or verification equipment
- ☐ Other. Please specify: _____

Q86 In your opinion, what standards should be included in a ***national halal certification*** for meat and poultry? Select all that apply.
- ☐ Zabiha (hand-slaughter)
- ☐ Machine-slaughter
- ☐ Slaughterers of Muslim faith
- ☐ Slaughterers of Christian or Jewish faith
- ☐ Individual spoken blessings
- ☐ Animal(s) not stunned
- ☐ Animal(s) face Mecca at time of slaughter
- ☐ Non-GMO
- ☐ Other. Please specify: _____

Q87 For a national halal certification, please indicate which parties **should** have access to the names of slaughter and/or processing establishment(s) at which an individual ***halal*** meat or poultry product was produced. Select all that apply.
- ☐ General public
- ☐ Processors/slaughterers
- ☐ Distributors/wholesalers
- ☐ Retailers/restaurants
- ☐ Government organizations
- ☐ ⊗None of the above

Q88 Please indicate which parties **should** have access to a national list of ***halal*** certified meat/poultry establishments certified with a ***national halal certification***. Select all that apply.
- ☐ General public
- ☐ Processors/slaughterers
- ☐ Distributors/wholesalers
- ☐ Retailers/restaurants
- ☐ Government organizations
- ☐ ⊗None of the above

Q89 Please indicate which parties **should** have access to the name(s) of enforcement agencies that certify ***halal*** establishments with a ***national halal certification***. Select all that apply.
- ☐ General public
- ☐ Processors/slaughterers
- ☐ Distributors/wholesalers
- ☐ Retailers/restaurants
- ☐ Government organizations
- ☐ ⊗None of the above

Q90 Please indicate which parties **should** have access to information regarding the ***halal*** standards used in slaughter and/or processing under a ***national halal certification***. Select all that apply.

- General public
- Processors/slaughterers
- Distributors/wholesalers
- Retailers/restaurants
- Government organizations
- ⊗None of the above

Q91 How should the general public be able to access information related to a ***national halal certification*** program for meat/poultry (e.g., where it is was produced, what halal standards were used)? Select all that apply.

- Online (e.g., company website, online database)
- Using a QR code/cell phone app
- Freedom of Information Act (FOIA) request
- Other. Please specify: _____

Q92 Who should ***set*** standards for a new ***national halal certification*** for meat and poultry? Select all that apply.

Note: U.S. and state governments are not legally allowed to define standards for religious products.

- Non-government organizations
- Religious organizations
- Certifier-led organizations
- Producer-led organizations
- Slaughterers/processors
- Distributors/wholesalers
- Retailers/restaurants
- Other. Please specify: _____

Q93 Who should ***enforce*** a new ***national halal certification*** for meat and poultry? Select all that apply.

- U.S. government organization (e.g., the USDA)
- State government organization (e.g., state department of agriculture)
- Non-government organizations
- Religious organizations
- Certifier-led organizations
- Producer-led organizations
- Slaughterers/processors
- Distributors/wholesalers
- Retailers/restaurants
- Other. Please specify: _____

Q94 Please select the degree to which you agree or disagree with the following statements:

	Agree	Neutral	Disagree
Halal meat or poultry tastes better than *non-halal* meat or poultry	○	○	○
All *halal* meat or poultry retail stores must be *halal* certified	○	○	○
Halal retail stores that are certified have a stronger reputation than *halal* retail stores that are not certified	○	○	○
Halal meat/poultry is more sanitary than *non-halal* meat/poultry	○	○	○
The *halal* slaughter process is more humane for the animal	○	○	○
Retail stores that are not *halal* certified cannot be trusted to supply authentic *halal* products	○	○	○
Halal meat and poultry is higher quality than *non-halal* meat and poultry	○	○	○
Halal meat and poultry is healthier than *non-halal* meat and poultry	○	○	○
If a retail store has a good reputation for supplying *halal* meat and poultry products, it does not need to be certified as *halal*	○	○	○

Q145 The following question is to verify that you are a real person.   Which of the following is equal to 10 plus 21?
- ○   11
- ○   17
- ○   31

Q95 What is your current age?
- ○   18-24 years old
- ○   25-34 years old
- ○   35-44 years old
- ○   45-54 years old
- ○   55-64 years old
- ○   65-74 years old
- ○   75 years or older
- ○   Prefer not to disclose

Q96 Were you born in the U.S.?
- ○   Yes
- ○   No, I was born in this country: _____
- ○   Prefer not to disclose

Q97 Were your parents and grandparents born in the U.S.?
- ○   Yes
- ○   No, they were born in this/these countries: _____
- ○   Prefer not to disclose

Display This Question:
   If Q96 = No, I was born in this country:
   Or Were you born in the U.S.? Text Response Is Not Empty

Q98 How long have you lived in the U.S.?
- ○   0-5 years
- ○   6-10 years

- 11-15 years
- 16-20 years
- 21-25 years
- Over 25 years
- Prefer not to disclose

Q99 What is your gender?
- Male
- Female
- Prefer to self-describe: _____
- Prefer not to disclose

Q100 What is the highest level of education you have completed?
- Less than High School
- High school graduate or GED
- Some college
- 2-year degree (Associates)
- 4-year degree (BA, BS)
- Professional degree (JD, MD, PhD, etc.)
- Prefer not to disclose

Q101 Are you of Hispanic, Latino, or Spanish origin?
- No
- Yes; please specify: _____
- Prefer not to disclose

Q102 What is your race? Select all that apply.
- ☐ White
- ☐ Black or African American
- ☐ Native American or Alaska Native
- ☐ Native Hawaiian or Pacific Islander
- ☐ Asian
- ☐ Other. Please specify: _____
- ☐ ⊗Prefer not to disclose

Q103 Which U.S. political party do you most identify with?
- Democrat
- Republican
- I am an independent
- Other. Please specify: _____
- Prefer to not disclose

Q104 Which best describes the area in which you live?
- Rural
- Suburban or mid-size city
- Urban or large city
- Prefer not to disclose

Q105 Do you consider yourself to be religious?
- No
- Yes, I am: _____
- Prefer not to disclose

Display This Question:

Q106 Have you followed a religion in the past even if you do not do so now?
   ○   No
   ○   Yes, I was: _____
   ○   Prefer not to disclose

Q107 Do you have any final thoughts or comments you wish to share about selling/not selling halal meat or poultry at your store?

   _____

   _____

Q143 Thank you for completing this survey! If you would like to retrieve your $25 reward for participating, please enter your email address in the box below, and I will reach out to you with your gift card. If you do not wish to receive your gift card, you can click the "Next" button at the bottom of the screen to skip this question. ***Please note that in order to qualify for this gift card, your survey response will need to meet data quality standards and will be reviewed by the research team. Gift cards will be sent out on a weekly or bi-weekly basis, so it may take up to 14 days to receive your gift card.*** Thank you for your participation in this research project!

   Email address for gift card:_____

Halal Meat Consumer Survey

Q1 You are being asked to participate in a research study of U.S. Muslim consumer preferences for halal meat and poultry retail purchases.   Your participation in this study will take about twenty (20) minutes. You will be asked to respond to a series of questions about how you purchase halal meat, your preferences for retail locations, and halal meat certifications. We also ask some basic demographic questions. This survey will assist researchers to anticipate the demand for various halal meat products and improve awareness of halal-related issues or events that could affect demand. Researchers are required to provide a consent form to inform you about the research study, to convey that participation is voluntary, to explain risks and benefits of participation, and to empower you to make an informed decision. You should feel free to ask the researchers any questions you may have.

Study Title: U.S. Meat Industry Overview: Consumer Preferences, Retailer Motivations, and Processor Practices

Researcher Title and Contact Information: Melissa G.S. McKendree, PhD, mckend14@msu.edu and Kelsey Hopkins, PhD candidate, hopki190@msu.edu, 847-513-1708

Department and Institution: Department of Agricultural, Food, and Resource Economics, Michigan State University

Sponsor: USDA-Agriculture and Food Research Initiative

The risks associated with this study are minimal. The risks are not greater than those ordinarily encountered in daily life. Moreover, you may stop the survey at any time. The data will only be released in summaries in which no individual's answers can be identified. You have the right to say no to participate in the research. You can stop at any time after it has already started. There will be no consequences if you stop, and you will not be criticized. You will not lose any benefits that you normally receive.

If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury, please contact the researcher Melissa G.S. McKendree, 202 Morrill Hall of Agriculture, East Lansing, MI, 48824, mckend14@msu.edu. If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 4000 Collins Rd, Suite 136, Lansing, MI 48910.

Continuing with the survey means that you voluntarily agree to participate in this research study. Please click the arrow at the bottom of the screen to continue.

Q2 Please ensure you are carefully reading through the statements and making thoughtful selections in order to qualify for the incentive. Any nonsense answers, keyboard slamming, quality issues, or speeding will be disqualified without incentive.

○   Agree and continue

   ○   Disagree and exit

Skip To: End of Block If Please ensure you are carefully reading through the statements and making thoughtful selections i... = Disagree and exit

Q3 Are you 18 years or older and live in the U.S.?
- ○ Yes
- ○ No

Q4 Have you purchased a ***halal*** meat or poultry product in the last twelve (12) months?
- ○ Yes
- ○ No

Q5 Do you identify as Muslim?
- ○ Yes
- ○ No

Q6 Are you one of the primary grocery shoppers for your household?
- ○ Yes
- ○ No

Q7 Do you follow a vegetarian, vegan, or pescatarian diet? (That is, you do not eat meat.)
- ○ Yes
- ○ No

Q8 How often do you eat halal meat products?
- ○ Always. I never eat non-halal meat products.
- ○ Very often. It is rare that I eat meat that is non-halal.
- ○ Often. I frequently eat halal meat products.
- ○ Somewhat often. I eat halal meat products, but I eat non-halal meat products just as frequently.
- ○ Almost never. I typically eat non-halal meat products.
- ○ Never.

Q9 If halal meat products are not available, will you purchase kosher meat products to eat instead?
- ○ Always. I always purchase kosher meat if halal meat is not available.
- ○ Very often. It is very common that I purchase kosher meat if halal meat is not available.
- ○ Often. I frequently purchase kosher meat if halal meat is not available.
- ○ Somewhat often. I purchase kosher meat about half of the time if halal meat is not available.
- ○ Almost never. It is rare that I purchase kosher meat if halal meat is not available.
- ○ Never. I do not purchase kosher meat if halal meat is not available.

Q10 If halal meat products are not available, will you purchase vegetarian or pescatarian (fish/seafood) options instead?

- Always. I always purchase vegetarian or pescatarian options if halal meat is not available.
- Very often. It is very common that I purchase vegetarian or pescatarian options if halal meat is not available.
- Often. I frequently purchase vegetarian or pescatarian options if halal meat is not available.
- Somewhat often. I purchase vegetarian or pescatarian options about half of the time if halal meat is not available.
- Almost never. It is rare that I purchase vegetarian or pescatarian options if halal meat is not available.
- Never. I do not purchase vegetarian or pescatarian options if halal meat is not available.

Q11 Please indicate whether you agree or disagree with the following statements:

⊗I prefer that my *halal* meat retailer is reliable	▼ Strongly agree ... Not applicable/ Unsure
⊗I prefer that my *halal* meat retailer is considerate and nice	▼ Strongly agree ... Not applicable/ Unsure
⊗I prefer that my *halal* meat retailer is well-stocked	▼ Strongly agree ... Not applicable/ Unsure
⊗I prefer that my *halal* meat retailer sells quality *halal* meat products	▼ Strongly agree ... Not applicable/ Unsure
⊗I prefer that my *halal* meat retailer is transparent and honest	▼ Strongly agree ... Not applicable/ Unsure

Q12 What is the name of the store you purchase the majority of your ***everyday halal*** meat and poultry products from?

 Note: "Everyday" halal meat and poultry products are those you purchase for daily consumption outside of religious holidays such as Eid.

- Name of store: _____

Q13 This section of the survey asks you about your buying relationship with ${e://Field/Store%20Name}.

Q14 Please indicate whether you agree or disagree with the following statements:

${e://Field/Store%20Name} demonstrates empathy and kindness toward me and treats everyone fairly	▼ Strongly agree ... Not applicable/ Unsure
${e://Field/Store%20Name} openly shares information, motives, and choices in straightforward and plain language	▼ Strongly agree ... Not applicable/ Unsure
${e://Field/Store%20Name} consistently and dependably delivers on their promises	▼ Strongly agree ... Not applicable/ Unsure
${e://Field/Store%20Name} communicates product characteristics in plain and easy to understand language	▼ Strongly agree ... Not applicable/ Unsure
${e://Field/Store%20Name} resolves issues in an adequate and timely manner	▼ Strongly agree ... Not applicable/ Unsure

Q15 Please indicate whether you agree or disagree with the following statements:

${e://Field/Store%20Name} quickly resolves issues with safety, security and satisfaction in mind	▼ Strongly agree ... Not applicable / Unsure
${e://Field/Store%20Name} values and respects everyone, regardless of background, identity or beliefs	▼ Strongly agree ... Not applicable / Unsure
${e://Field/Store%20Name} values the good of society and the environment, not just profit	▼ Strongly agree ... Not applicable / Unsure
${e://Field/Store%20Name} is upfront about how they make and spend money from our interactions	▼ Strongly agree ... Not applicable / Unsure
${e://Field/Store%20Name} is clear and upfront about fees and costs of products, services and experiences	▼ Strongly agree ... Not applicable / Unsure

Q16 Please indicate whether you agree or disagree with the following statements:

${e://Field/Store%20Name}'s products are good quality, accessible and safe to use	▼ Strongly agree ... Not applicable/ Unsure
${e://Field/Store%20Name}'s prices are good value for the money	▼ Strongly agree ... Not applicable/ Unsure
${e://Field/Store%20Name}'s employees and leadership are competent and understand how to respond to my needs	▼ Strongly agree ... Not applicable/ Unsure
${e://Field/Store%20Name} can be counted on to improve the quality of their products and services	▼ Strongly agree ... Not applicable/ Unsure
${e://Field/Store%20Name} consistently delivers products, services, and experiences with quality	▼ Strongly agree ... Not applicable/ Unsure

Q17 Please indicate whether you agree or disagree with the following statements:

⊗${e://Field/Store%20Name} sells quality *halal* meat products	▼ Strongly agree ... Not applicable/ Unsure
⊗${e://Field/Store%20Name} takes care of their employees	▼ Strongly agree ... Not applicable/ Unsure
⊗${e://Field/Store%20Name}'s marketing and communications are accurate and honest	▼ Strongly agree ... Not applicable/ Unsure
⊗${e://Field/Store%20Name} creates long term solutions and improvements that work well for me	▼ Strongly agree ... Not applicable/ Unsure
⊗${e://Field/Store%20Name} facilitates digital interactions that run smoothly and work when needed (e.g., placing online or phone orders)	▼ Strongly agree ... Not applicable/ Unsure

Q18 Please rate your overall relationship (in terms of trustworthiness, friendliness, reliability, and transparency) with ${e://Field/Store%20Name}. A score of "100" indicates your relationship with ${e://Field/Store%20Name} is ideal or perfect, a score of "0" indicates your relationship is nonexistent.

0   10   20   30   40   50   60   70   80   90   100

Q19 In this section of the survey, we will be asking you questions about ${e://Field/Store%20Name} and the *halal* meat or poultry products you purchase there.

Q20 What type of store is ${e://Field/Store%20Name}?
○ Small ethnic grocery store (for example, an Asian or Indo-Pakistani grocery store)
○ Small local or regional non-ethnic grocery store
○ Box/chain store (for example, Walmart, Whole Foods, Meijer)
○ Membership store (for example, Costco, Restaurant Depot)
○ Butcher shop (that is, they sell **only** meat or poultry products)
○ Online retailer (for example, One Stop Halal, Crescent Foods)
○ Other. Please specify: _____

Q21 How often do you purchase *halal* meat or poultry products from ${e://Field/Store%20Name}?
○ Daily
○ 4-6 times a week
○ 2-3 times a week
○ Once a week
○ Every other week
○ Once a month
○ Every other month
○ 3-5 times per year
○ 1-2 times per year

Q22 When you purchase *halal* meat or poultry, do you purchase only for your household, or do you purchase on behalf of a group or multiple households?
○ Only my household
○ Multiple households or a group

Q23 When you buy *halal* meat or poultry products from ${e://Field/Store%20Name}, what kinds of products do you purchase? (Select all that apply)
☐ Fresh whole cuts or ground products (for example, chicken breasts or ground beef purchased at a butcher counter)
☐ Pre-packaged fresh whole cuts or ground products (for example, steak or ground turkey available in coolers/on refrigerated shelves)
☐ Frozen packaged whole cuts (for example, frozen chicken breasts)
☐ Refrigerated processed products (for example, lunch/deli meat, hot dogs)
☐ Frozen processed products (for example, frozen dinners, frozen hamburger patties)
☐ Ready to eat processed products (for example, jerky, snack sticks)
☐ Other. Please specify: _____

Display This Question:
If When you buy halal meat or poultry products from ${e://Field/Store%20Name}, what kinds of product... = Fresh whole cuts or ground products (for example, chicken breasts or ground beef purchased at a butcher counter)

Q24 When shopping at ${e://Field/Store%20Name}, which types of *halal* meat or poultry do you purchase as **fresh whole cuts** (for example, chicken breasts or ground beef purchased from a

butcher counter)?
 Select all that apply.
- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q25 When shopping at ${e://Field/Store%20Name}, which types of *halal* meat or poultry do you purchase as **pre-packaged refrigerated whole cuts** (for example, steaks or ground turkey available in coolers/on refrigerated shelves)? Select all that apply.
- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q26 When shopping at ${e://Field/Store%20Name}, which types of *halal* meat or poultry do you purchase as **frozen packaged whole cuts** (for example, chicken breasts available in freezers)? Select all that apply.
- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify:

Q27 When shopping at ${e://Field/Store%20Name}, which types of *halal* meat or poultry do you purchase as **refrigerated processed products** (for example, lunch/deli meat, hotdogs)?
 Select all that apply.
- ☐ Beef
- ☐ Veal

- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q28 When shopping at ${e://Field/Store%20Name}, which types of *halal* meat or poultry do you purchase as **frozen processed products** (for example, frozen dinners, frozen hamburger patties)? Select all that apply.
- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q29 When shopping at ${e://Field/Store%20Name}, which types of *halal* meat or poultry do you purchase as **ready to eat processed products** (for example, jerky, snack sticks)?
 Select all that apply.
- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey
- ☐ Chicken
- ☐ Other. Please specify: _____

Q30 When shopping at ${e://Field/Store%20Name}, which types of *halal* meat or poultry do you purchase as **${Q23/ChoiceTextEntryValue/6}**?
 Select all that apply.
- ☐ Beef
- ☐ Veal
- ☐ Lamb
- ☐ Goat
- ☐ Turkey

☐ Chicken

☐ Other. Please specify: _____

Q31 Is ${e://Field/Store%20Name} certified by a *halal* certification organization (for example, the store has a sign/certificate displayed from a certifier)?

○ Yes. Please specify certifier if known: _____

○ No

○ I don't know

Q32 Does ${e://Field/Store%20Name} sell individually *halal* certified meat products? (for example, a package has a label or stamp on it that says *"halal"*)

○ Yes. Please specify certifier if known: _____

○ No

○ I don't know

Q33 Please select all factors that contributed to your decision to purchase from ${e://Field/Store%20Name}. (Select all that apply)

☐ Recommendations from friends or family

☐ Good customer service

☐ Online reviews

☐ Recommendations from mosque, Islamic community center, or other religious leader/group

☐ Reputation or history as a trustworthy retailer

☐ Store carries a *halal* certification for all meat or poultry products

☐ Certified *halal* meat products available

☐ Owner / staff is Muslim

☐ Retailer serves my country's community (for example, Indo-Pakistani, Somali, Turkish)

☐ Low/no sales tax

☐ Near other businesses I shop at

☐ Low/fair prices

☐ Near where I live

☐ Near where I work

☐ Cleanliness / sanitary environment

☐ Quality of products available

☐ Other. Please specify: _____

Q34 What standard of *halal* meat or poultry products do you purchase?

○ Zabiha (hand-slaughtered) *halal*

○ Machine-slaughtered *halal*

○ Whichever is available

○ I do not have a preference

○ I do not know the difference between Zabiha and machine-slaughtered *halal*

Q35 What standards do you prefer when you purchase your *halal* meat and poultry products? Select all that apply.

☐ Zabiha (hand-slaughter)

☐ Machine-slaughter

☐ Slaughterers of Muslim faith

☐ Slaughterers of Christian or Jewish faith

- ☐ Individual spoken blessings
- ☐ Animal(s) not stunned
- ☐ Animal(s) face Mecca at time of slaughter
- ☐ Does not contain genetically modified organisms (non-GMO)
- ☐ Other. Please specify: _____

Q36 Where or from whom do you get information about ***what standards are required*** for meat or poultry to be *halal?* Select all that apply.

- ☐ Friends / family
- ☐ Religious leader / group (for example, from your imam, your mosque, or Islamic community center)
- ☐ Social media page(s) (for example, a Facebook group)
- ☐ Store websites / advertisements
- ☐ Halal certifiers
- ☐ Other. Please specify: _____

Q37 Where or from whom do you get information about ***where to find*** authentic *halal* meat or poultry? Select all that apply.

- ☐ Friends / family
- ☐ Religious leader / group (for example, from your imam, your mosque, or Islamic community center)
- ☐ Social media page(s) (for example, a Facebook group)
- ☐ Store websites / advertisements
- ☐ Halal certifiers
- ☐ Consumer apps / websites (for example, Scan Halal)
- ☐ Other. Please specify: _____

Q56 The following question is to verify that you are a real person.   Which of the following is equal to 10 + 21?

- ○ 9
- ○ 31
- ○ 53

Skip To: End of Block If The following question is to verify that you are a real person. Which of the following is equal t... != 31

Q38 ***Please read these instructions and descriptions carefully, as they are important for the next questions.***

In this section of the survey, you will be asked **eight (8)** questions where you will choose between two (2) different stores to purchase *halal* meat and poultry products, or have the option to not shop at either store.

When comparing the stores, you will see different characteristics: The use of a comprehensive store-wide *halal* certification A *halal* certification only on individual products   Your one-way travel time to the store   Your relationship with the retailer.   **All other characteristics of the stores are the same (for example, prices and variety of products available) - that is, your choice should depend on the information shown.**
 In the following questions, you will be shown pictures of the stores you are choosing between to

help you to visualize your choice.

_____

Halal Certifications

For the purpose of this survey, the *halal* standards for these certifications are those that you prefer (for example, hand or machine cut, stunned or not stunned).

On the front of these stores, you will see different *halal* certification logos, which are also shown here with a description:
    The store above with the green 8-point star is certified *halal*, meaning that all the meat and poultry products sold inside are certified as *halal*.   The store above with the blue 18-point star carries *halal* certified meat and poultry products, but not all meat and poultry products sold inside are necessarily certified as *halal*. *Halal* certified meat and poultry products would be labeled individually with the *halal* certification.   The store above with the green 8-point star and blue 18-point star is both *halal* certified and carries *halal* certified meat and poultry products, meaning that all the meat and poultry products sold inside are certified as halal and all of these products are additionally individually labeled as halal certified.

_____

Travel Time

Travel time is the one-way time shown is the minutes it takes you to get to the retailer from your home. Travel times will be either 15, 30, 45, or 60 minutes one-way.

_____

Relationship

You will see four (4) different possible levels of your relationship with the retailer; these are given below with definitions.

No relationship with this retailer: You have never purchased from this store before and do not know anything about their trustworthiness, friendliness, reliability, or transparency.

Relationship I have with my current retailer: This is the current relationship you have with the retailer you purchase from most frequently, in terms of trustworthiness, friendliness, reliability, and transparency.

Best retailer relationship I have experienced: This is the best relationship you have had with a retailer in terms of trustworthiness, friendliness, reliability, and transparency.

Ideal or perfect retailer relationship: This is the most trustworthy, friendly, reliable, and transparent retailer you can imagine purchasing halal meat and poultry products from.

Q39 **IMPORTANT:** Previous similar surveys have found that people often state they are willing to shop at different stores when they are not actually willing to do so. Accordingly, it is important that you make each of your upcoming selections like you would if you were actually facing these exact choices; that is, noting that choosing to shop at one store means that you would not shop at the other location for your *halal* meat or poultry products. The accuracy of your responses is very important, as the information collected here will be used to help design future policies and regulations for *halal* meat and poultry products.

Please read carefully and be aware that every question has different information even though they may look very similar.

Q40 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?

○ No certifications present 60 minutes total time spent traveling to the store Best retailer relationship I have experienced
○ Store and product certifications present   45 minutes total time spent traveling to the store Ideal or perfect retailer relationship
○ I would not shop for halal meat products at either of these two stores

Q41 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?

○ No certifications present 15 minutes total time spent traveling to the store Ideal or perfect retailer relationship
○ Product and store certifications present   60 minutes total time spent traveling to the store No relationship with this retailer
○ I would not shop for halal meat products at either of these two stores

Q42 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?

○ Product certification present 30 minutes total time spent traveling to the store No relationship with this retailer
○ Store certification present   15 minutes total time spent traveling to the store Relationship I have with my current retailer
○ I would not shop for halal meat products at either of these two stores

Q43 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?

○ Product certification present 45 minutes total time spent traveling to the store Relationship I have with my current retailer
○ Store certification present 30 minutes total time spent traveling to the store Best retailer relationship I have experienced
○ I would not shop for halal meat products at either of these two stores

Q44 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account certifications, one-way travel time to the store, and your relationship with the retailer?

○ Store certification present 45 minutes total time spent traveling to the store No relationship with this retailer
○ Product certification present 30 minutes total time spent traveling to the store Relationship I have with my current retailer
○ I would not shop for halal meat products at either of these two stores

Q45 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?

- Store certification present 30 minutes total time spent traveling to the store Relationship I have with my current retailer
- Product certification present 15 minutes total time spent traveling to the store Best retailer relationship I have experienced
- I would not shop for halal meat products at either of these two stores

Q46 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?
- Store and product certifications present 15 minutes total time spent traveling to the store Best retailer relationship I have experienced
- No certifications present 60 minutes total time spent traveling to the store Ideal or perfect retailer relationship
- I would not shop for halal meat products at either of these two stores

Q47 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?
- Store and product certifications present 60 minutes total time spent traveling to the store Ideal or perfect retailer relationship
- No certifications present 45 minutes total time spent traveling to the store No relationship with this retailer
- I would not shop for halal meat products at either of these two stores

Q48 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?
- No certifications present 15 minutes total time spent traveling to the store No relationship with this retailer
- Store and product certifications present 60 minutes total time spent traveling to the store Relationship I have with my current retailer
- I would not shop for halal meat products at either of these two stores

Q49 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?
- No certifications present 60 minutes total time spent traveling to the store Relationship I have with my current retailer
- Store and product certifications present 45 minutes total time spent traveling to the store Best retailer relationship I have experienced
- I would not shop for halal meat products at either of these two stores

Q50 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?
- Product certification present 45 minutes total time spent traveling to the store Best retailer relationship I have experienced
- Store certification present 30 minutes total time spent traveling to the store Ideal or perfect retailer relationship
- I would not shop for halal meat products at either of these two stores

Q51 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?
○ Product certification present 30 minutes total time spent traveling to the store Ideal or perfect retailer relationship
○ Store certification present   15 minutes total time spent traveling to the store No relationship with this retailer
○ I would not shop for halal meat products at either of these two stores

Q52 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?
○ Store certification present 30 minutes total time spent traveling to the store Best retailer relationship I have experienced
○ Product certification present   15 minutes total time spent traveling to the store Ideal or perfect retailer relationship
○ I would not shop for halal meat products at either of these two stores

Q53 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?
○ Store certification present 45 minutes total time spent traveling to the store Ideal or perfect retailer relationship
○ Product certification present   30 minutes total time spent traveling to the store No relationship with this retailer
○ I would not shop for halal meat products at either of these two stores

Q54 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?
○ Store and product certifications present 60 minutes total time spent traveling to the store No relationship with this retailer
○ No certification present   45 minutes total time spent traveling to the store Relationship I have with my current retailer
○ I would not shop for halal meat products at either of these two stores

Q55 Imagine you are grocery shopping and want to purchase halal meat or poultry products. Of the stores below, which would you prefer to purchase from, taking into account halal certifications, one-way travel time to the store, and your relationship with the retailer?
○ Store and product certifications present 15 minutes total time spent traveling to the store Relationship I have with my current retailer
○ No certification present   60 minutes total time spent traveling to the store Best retailer relationship I have experienced
○ I would not shop for halal meat products at either of these two stores

Q57 Please select the degree to which you agree or disagree with the following statements:

Halal meat and poultry is healthier to eat than *non-halal* meat and poultry	▼ Strongly agree ... Not applicable / Unsure
I will never eat meat or poultry that is not *halal* certified	▼ Strongly agree ... Not applicable / Unsure
Halal meat and poultry is cleaner/more hygienic than *non-halal* meat or poultry	▼ Strongly agree ... Not applicable / Unsure
I have access to good information about *halal* certified meat and poultry in the U.S.	▼ Strongly agree ... Not applicable / Unsure
Halal meat and poultry tastes better than *non-halal* meat and poultry	▼ Strongly agree ... Not applicable / Unsure

Q58 Please select the degree to which you agree or disagree with the following statements:

I will not buy a meat or poultry product if my peers or family have doubts about whether it is truly *halal*	▼ Strongly agree ... Not applicable / Unsure
I always check labels to see if all ingredients are *halal* before purchasing	▼ Strongly agree ... Not applicable / Unsure
Halal meat and poultry slaughtering is more humane than *non-halal* meat and poultry slaughtering	▼ Strongly agree ... Not applicable / Unsure
It is easy for me to tell if a meat or poultry product is *halal*	▼ Strongly agree ... Not applicable / Unsure
I am willing to travel extra miles to get authentic *halal* meat or poultry products	▼ Strongly agree ... Not applicable / Unsure
I check to see if a restaurant serves *halal* food before I eat there	▼ Strongly agree ... Not applicable / Unsure

Q59 Please select the degree to which you agree or disagree with the following statements:

I am willing to pay more for meat or poultry that has been certified as *halal*	▼ Strongly agree ... Not applicable / Unsure
If *halal* meat or poultry is not available, I will chose a seafood or vegetarian option instead	▼ Strongly agree ... Not applicable / Unsure
I always check to see if a meat or poultry product is certified *halal* before eating it	▼ Strongly agree ... Not applicable / Unsure
I have enough knowledge about U.S. *halal* meat and poultry to tell the difference between *halal* certified and *non-halal* meat and poultry	▼ Strongly agree ... Not applicable / Unsure

Q60 Now we will move onto the next portion of the survey, which will ask you questions about your opinions about a national *halal* certification program.

Q61 There is not a NHMC program in the U.S. We are interested in your opinions to help design a future national U.S. meat and poultry *halal* certification program.

In the following section of the survey, you will be presented seven (7) scenarios. Please consider the three (3) factors presented, and indicate which one (1) factor is the least important and which one (1) is the most important to you when designing a national U.S. *halal* meat and poultry certification program. Please select one factor as least important ***AND*** one factor as most important in each question.

The questions look similar but contain different comparisons of factors. Please treat each question individually.

To help, we have given an example below with ice cream, where flavor is the most important factor and price is the least important factor in your decision to buy ice cream.

EXAMPLE

Of the following three (3) factors, which one (1) is the least important and which one (1) is the most important in your decision to buy ice cream?

Q62 Of the following three (3) factors, which one (1) is the least important and which one (1) is the most important to consider when designing a national U.S. *halal* meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	⊗**Which group(s) will enforce the program** (for example, government, religious organization, private non-religious organization)	○
○	⊗**What will be required to be certified** (for example, products, retailers, slaughter and processing establishments)	○
○	⊗**What halal standards will be required** (for example, hand versus machine slaughter, stunned or not stunned)	○

Q63 Of the following three (3) factors, which one (1) is the least important and which one (1) is the most important to consider when designing a national U.S. *halal* meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	⊗**Which group(s) will enforce the program** (for example, government, religious organization, private non-religious organization)	○
○	⊗**Inspection process** (for example, frequency, random or scheduled)	○
○	⊗**Benefits associated with certified products** (for example, transparency, reliability, quality)	○

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Q64 Of the following three (3) factors, which one (1) is the least important and which one (1) is the most important to consider when designing a national U.S. *halal* meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	⊗**Costs associated with certified products** (for example, higher prices)	○
○	⊗**Which group(s) will enforce the program** (for example, government, religious organization, private non-religious organization)	○
○	⊗**What product information I have access to and how I can access it** (for example, only available through the Freedom of Information Act (FOIA) versus accessible online)	○

Q65 Of the following three (3) factors, which one (1) is the least important and which one (1) is the most important to consider when designing a national U.S. *halal* meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	⊗**What product information I have access to and how I can access it** (for example, only available through the Freedom of Information Act (FOIA) versus accessible online)	○
○	⊗**Inspection process** (for example, frequency, random or scheduled)	○
○	⊗**What halal standards will be required** (for example, hand versus machine slaughter, stunned or not stunned)	○

Q66 Of the following three (3) factors, which one (1) is the least important and which one (1) is the most important to consider when designing a national U.S. *halal* meat and poultry certification program?

Least Important *(Check only one)*		Most Important *(Check only one)*
○	⊗**Benefits associated with certified products** (for example, transparency, reliability, quality)	○
○	⊗**What halal standards will be required** (for example, hand versus machine slaughter, stunned or not stunned)	○
○	⊗**Costs associated with certified products** (for example, higher prices)	○

Q67 Of the following three (3) factors, which one (1) is the least important and which one (1) is the most important to consider when designing a national U.S. *halal* meat and poultry certification program?

Least Important (Check only one)		Most Important (Check only one)
○	⊗**Costs associated with certified products** (for example, higher prices)	○
○	⊗**What will be required to be certified** (for example, products, retailers, slaughter and processing establishments)	○
○	⊗**Inspection process** (for example, frequency, random or scheduled)	○

Q68 Of the following three (3) factors, which one (1) is the least important and which one (1) is the most important to consider when designing a national U.S. *halal* meat and poultry certification program?

Least Important (Check only one)		Most Important (Check only one)
	⊗**What product information I have access to and how I can access it** (for example, only available through the Freedom of Information Act (FOIA) versus accessible online)	
	⊗**Benefits associated with certified products** (for example, transparency, reliability, quality)	
	⊗**What will be required to be certified** (for example, products, retailers, slaughter and processing establishments)	

Q69 Should individual products or supply chain members be required to have a *national halal certification* to ensure authentic *halal* meat and poultry products?
- ○ Individual products
- ○ Supply chain members (for example, processor, wholesaler, retailer)
- ○ Both individual products and supply chain members

Display This Question:
   If Should individual products or supply chain members be required to have a national halal certifica... = Supply chain members (for example, processor, wholesaler, retailer)
   Or Should individual products or supply chain members be required to have a national halal certifica... = Both individual products and supply chain members

Q70 Which members of the supply chain should be required to have a *national halal certification*? Select all that apply.
- ☐ Slaughter establishments
- ☐ Processing establishments
- ☐ Distributors or transportation services
- ☐ Retailers and wholesalers
- ☐ Restaurants and food service
- ☐ Other. Please specify: _____

Q71 Under a *national halal certification*, how should a certified business be inspected?
- ○ Pre-scheduled inspections
- ○ Random/surprise inspections
- ○ A mixture of pre-scheduled and random inspections
- ○ Other. Please specify: _____

Q72 If there were a *national halal certification* for meat and poultry, what should be the minimum requirements for the certification? Select all that apply.
- ☐ Zabiha (hand-slaughter)
- ☐ Machine-slaughter
- ☐ Slaughterers of Muslim faith
- ☐ Slaughterers of Christian or Jewish faith
- ☐ Individual spoken blessings
- ☐ Animal(s) not stunned
- ☐ Animal(s) face Mecca at time of slaughter
- ☐ Not genetically modified (Non-GMO)
- ☐ Other. Please specify: _____

Q73 Please indicate which parties **should** have access to the names of establishment(s) at which a *halal* meat or poultry product was slaughtered and/or processed using a *national halal certification*. Select all that apply.
- ☐ General public
- ☐ Processors/slaughterers
- ☐ Distributors/wholesalers
- ☐ Retailers/restaurants
- ☐ Government organizations
- ☐ ⊗None of the above

Q74 Please indicate which parties **should** have access to a national list of *halal* certified meat/poultry establishments certified with a *national halal certification*. Select all that apply.

- ☐ General public
- ☐ Processors/slaughterers
- ☐ Distributors/wholesalers
- ☐ Retailers/restaurants
- ☐ Government organizations
- ☐ ⊗None of the above

Q75 Please indicate which parties **should** have access to the name(s) of enforcement agencies that certify *halal* establishments with a *national halal certification*. Select all that apply.

- ☐ General public
- ☐ Processors/slaughterers
- ☐ Distributors/wholesalers
- ☐ Retailers/restaurants
- ☐ Government organizations
- ☐ ⊗None of the above

Q76 Please indicate which parties **should** have access to information regarding the *halal* standards used in slaughter and/or processing under a *national halal certification*. Select all that apply.

- ☐ General public
- ☐ Processors/slaughterers
- ☐ Distributors/wholesalers
- ☐ Retailers/restaurants
- ☐ Government organizations
  - ☐ ⊗None of the above

Display This Question:
  If Please indicate which parties should have access to the names of establishment(s) at which a hala... = General public
  Or Please indicate which parties should have access to a national list of halal certified meat/poult... = General public
  Or Please indicate which parties should have access to the name(s) of enforcement agencies that cert... = General public
  Or Please indicate which parties should have access to information regarding the halal standards use... = General public

Q77 How should the general public be able to access information related to a *national halal certification* program for meat/poultry? Select all that apply.

- ☐ Online (for example, company website, online database)
- ☐ Using a QR code/cell phone app
- ☐ Freedom of Information Act (FOIA) request
- ☐ Other. Please specify: _____

Q78 Who should *<u>set</u>* standards for a new *national halal certification* for meat and poultry? Select all that apply.
Note: U.S. and state governments are not legally allowed to define standards for religious products.

☐ Non-government organizations
☐ Religious organizations
☐ Certifier-led organizations
☐ Producer-led organizations
☐ Slaughterers/processors
☐ Distributors/wholesalers
☐ Retailers/restaurants
☐ Other. Please specify: _____

Q79 Who should ***enforce*** a new *national halal certification* for meat and poultry? Select all that apply.
☐ U.S. government organization (for example, the USDA)
☐ State government organization (for example, state department of agriculture)
☐ Non-government organizations
☐ Religious organizations
☐ Certifier-led organizations
☐ Producer-led organizations
☐ Slaughterers/processors
☐ Distributors/wholesalers
☐ Retailers/restaurants
☐ Other. Please specify: _____

Q80 Please select the degree to which you agree or disagree with the following statements:

	Agree	Neutral	Disagree
All *halal* meat or poultry slaughter or processing establishments must be *halal* certified	○	○	○
Halal establishments that are certified have a stronger reputation than *halal* establishments that are not certified	○	○	○
Establishments that are not *halal* certified cannot be trusted to supply authentic *halal* products	○	○	○
If an establishment has a good reputation for supplying *halal* meat and poultry products, it does not need to be certified as *halal*	○	○	○

Q81 Now we are going to ask you questions about yourself. These responses will only be used by the research team and will **not** be shared with any identifying information attached.

Q82 Which branch of Islam do you practice?
○ Sunni
○ Shia or Shiite
○ Ibadi
○ Non-denominational
○ Other. Please specify: _____
○ Prefer not to disclose

Q83 Have you converted or reverted to Islam?
○ Yes
○ No
○ Prefer not to disclose

Q84 Which religion did you follow prior to converting or reverting to Islam?
- ○ Christianity
- ○ Hinduism
- ○ Buddhism
- ○ Judaism
- ○ Sikhism
- ○ Other. Please specify: _____
- ○ None/ not applicable
- ○ Prefer not to disclose

Q85 Which branch of Christianity did you follow prior to converting or reverting to Islam?
- ○ Catholicism
- ○ Protestant (for example, Baptist, Lutheran, Methodist, Presbyterian, Pentecostal, Episcopalian)
- ○ Orthodox (for example, Greek, Eastern)
- ○ Prefer not to disclose

Q86 When did you convert to Islam?
- ○ 0-5 years ago
- ○ 6-10 years ago
- ○ 11-15 years ago
- ○ 16-20 years ago
- ○ 21-25 years ago
- ○ 26-30 years ago
- ○ 31-35 years ago
- ○ Over 35 years ago
- ○ Prefer not to disclose

Q87 I consider myself:
- ○ A vegetarian
- ○ A vegan
- ○ None of the above
- ○ Prefer not to disclose

Q88 What is your current age?
- ○ 18 - 24 years old
- ○ 25 - 34 years old
- ○ 35 - 44 years old
- ○ 45 - 54 years old
- ○ 55 - 64 years old
- ○ 65 - 74 years old
- ○ 75 years or older
- ○ Prefer not to disclose

Q89 What is your gender?

- Male
- Female
- Non-binary / third gender
- Prefer to self-describe: _____
- Prefer not to disclose

Q90 What is your current marital status?
- Single, Never Married
- Married
- Separated
- Divorced
- Widowed
- Prefer not to disclose

Q91 How many people (including yourself) live in your household?
- 1
- 2
- 3
- 4
- 5 or more
- Prefer not to disclose

Q92 Are there children under the age of 12 living in your household?
- Yes
- No
- Prefer not to disclose

Q93 Have you ever received food stamps?
- Yes
- No
- Prefer not to disclose

Q94 Are you currently on food stamps?
- Yes
- No
- Prefer not to disclose

Q95 In what U.S. state do you live?

▼ Alabama ... Wyoming

Q96 What is your ZIP code? _____

Q97 Please select your U.S. citizenship status.
- U.S. Citizen
- Lawful Permanent Resident
- Temporary Resident (e.g., visitor, student)
- Prefer not to disclose

Q98 Were you born in the U.S.?
- Yes
- No, I was born in this country: _____
- Prefer not to disclose

Q99 Were your parents born in the U.S.?
- Yes
- No, they were born in this country: _____

○ Prefer not to disclose

Q100 How long have you lived in the U.S.?

○ 0-5 years
○ 6-10 years
○ 11-15 years
○ 16-20 years
○ 21-25 years
○ 26-30 years
○ 31-35 years
○ More than 35 years
○ Prefer not to disclose

Q101 What is the highest level of education you have completed?

○ Less than High School
○ High School/GED
○ Some College
○ 2-Year College Degree (Associates)
○ 4-Year College Degree (BA, BS)
○ Master's Degree
○ Professional Degree (Ph.D., J.D., M.D., etc.)
○ Prefer not to disclose

Q102 What is your approximate annual household income before taxes?

○ Less than $20,000
○ $20,000 - $39,999
○ $40,000 - $59,999
○ $60,000 - $79,999
○ $80,000 - $99,999
○ $100,000 - $119,999
○ $120,000 - $139,999
○ $140,000 - $159,999
○ $160,000 or greater
○ Prefer not to disclose

Q103 Which category best describes you? Select all that apply.

☐ White (for example, German, Irish, English, Italian, Polish, French, etc.)
☐ Hispanic, Latino or Spanish origin (for example, Mexican or Mexican American, Puerto Rican, Cuban, Salvadoran, Dominican, Colombian, etc.)
☐ Black or African American (for example, African American, Jamaican, Haitian, Nigerian, Ethiopian, Somalian, etc.)
☐ Middle Eastern or North African (for example, Lebanese, Iranian, Egyptian, Syrian, Moroccan, Algerian, etc.)
☐ American Indian or Alaskan Native (for example, Navajo nation, Blackfeet tribe, Mayan, Aztec, Native Village or Barrow Inupiat Traditional Government, Nome Eskimo Community, etc.)
☐ Asian (for example, Chinese, Korean, Japanese, etc.)

☐ South or Southeast Asian (for example, Indian, Pakistani, Filipino, Vietnamese, Malaysian, etc.)

☐ Native Hawaiian or Other Pacific Islander (for example, Native Hawaiian, Samoan, Chamorro, Tongan, Fijian, etc.)

☐ Other. Please specify: _____

☐ Prefer not to disclose

Q104 Which U.S. political party do you most identify with?

○ Democratic

○ Republican

○ I am an independent

○ Other. Please specify: _____

○ Prefer not to disclose

Q105 Which best describes the area in which you live?

○ Rural

○ Suburban

○ Urban

○ Prefer not to disclose

Q106 Do you have any final comments to share about your responses or this study?

_____

_____

APPENDIX A.3 BEST-WORST SCALING RESULTS AND ADDITIONAL TABLES

The count data of the best-worst question responses is given in Figure 12, Figure 13, and Figure 14. Figure 12 aggregates these responses from halal and non-halal processors, Figure 13 gives the responses from halal processors only, and Figure 14 gives the responses from non-halal processors only. We exclude past halal processors from this analysis. Looking at the data in Figure 12, we may conclude that the meat and poultry processing industry overall is not strongly concerned about what requirements for information and transparency across the supply chain may be imposed by a national halal certification. Likewise, the benefits of certification and inspection type and frequency appear to have low importance to the industry overall. Costs of certification, which standards are included in the certification, and what establishments are required to carry a certification are overall more important to the industry.

However, when disaggregated into halal and non-halal processors, the count data provides a more nuanced insight into the market's preferences. For halal processors, which standards are included in a certification, what establishments are required to be certified, and who is in charge of enforcing the certification are highly important, while the remaining four factors are relatively unimportant to halal processors. For non-halal processors, the most important characteristics to consider when designing a national halal certification program are costs, what is included in the certification, and which establishments are required to be certified. The type of information and transparency passed along the supply chain appears very unimportant, while the remaining three factors are of relatively mild importance. When comparing halal and non-halal processors, I conclude that halal processors are overall more interested in the rigor of the standards and enforcement integrity of a potential national halal certification, while non-halal processors are most concerned with the costs and how they may need to adjust their business to meet standards.

Figure 12: Best-Worst Count Data by Attribute of Potential National Halal Certification Program, Current Halal and Non-Halal Processors Combined, n = 98
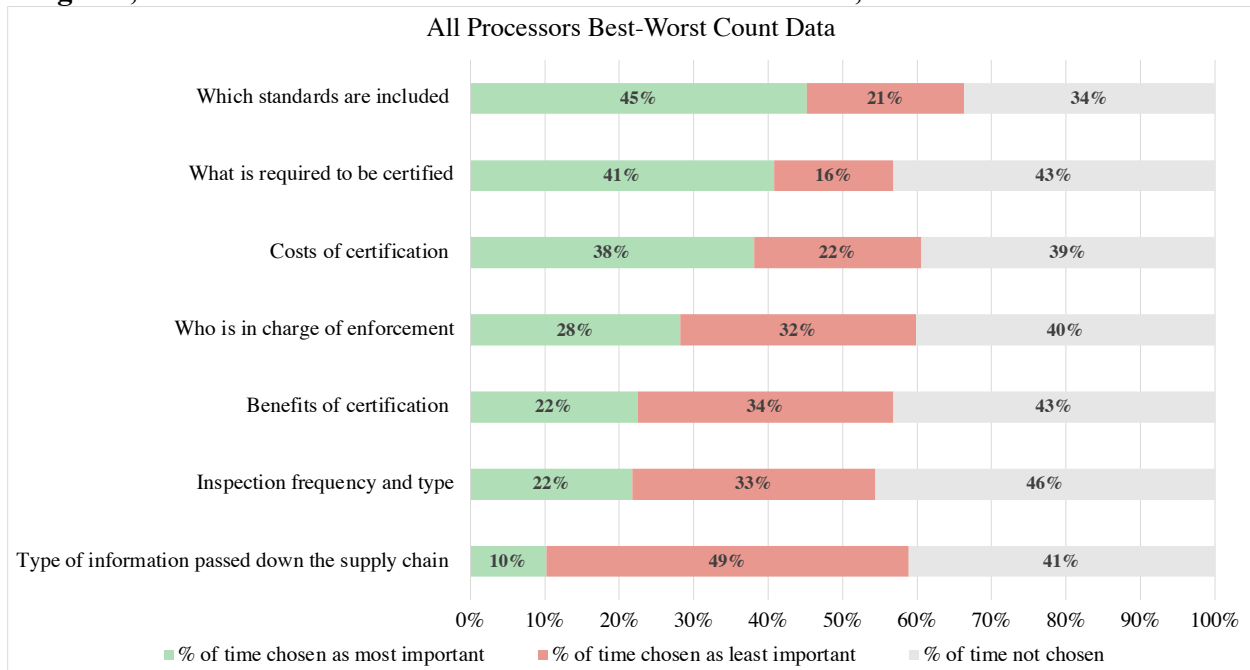
Figure 13: Best-Worst Count Data by Attribute of Potential National Halal Certification Program, Current Halal Processors, n = 32

Halal Processors Best-Worst Counts

Attribute	% of time chosen as most important	% of time chosen as least important	% of time not chosen
Which standards are included	66%	8%	27%
What is required to be certified	48%	18%	34%
Costs of certification	16%	50%	34%
Who is in charge of enforcement	41%	27%	32%
Benefits of certification	17%	38%	46%
Inspection frequency and type	16%	40%	44%
Type of information passed down the supply chain	14%	37%	49%

Figure 14: Best-Worst Count Data by Attribute of Potential National Halal Certification Program, Non-Halal Processors, n = 66

Non-Halal Processors Best-Worst Counts

Attribute	% of time chosen as most important	% of time chosen as least important	% of time not chosen
Which standards are included	39%	28%	34%
What is required to be certified	41%	16%	43%
Costs of certification	49%	12%	39%
Who is in charge of enforcement	24%	34%	43%
Benefits of certification	28%	34%	38%
Inspection frequency and type	25%	32%	43%
Type of information passed down the supply chain	7%	56%	37%

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Table 40: Multinomial Logit Results of Best-Worst Scaling for Hypothetical U.S. National Halal Meat and Poultry Certification Program: Processors (n = 82), Retailers (n = 33), and Consumers (n = 507)

Best-Worst Scaling Attributes	Processors Coefficient (st. error)	Retailers Coefficient (st. error)	Consumers Coefficient (st. error)
Cost of Certification	0.46***	0.39**	-0.25***
	(0.11)	(0.17)	(0.04)
Enforcement and Regulation	0.17	-0.14	-0.07
	(0.11)	(0.17)	(0.04)
Information Collected/Available	-0.41***	-0.46***	-0.16***
	(0.11)	(0.17)	(0.04)
Who/What Must be Certified	0.60***	0.62***	0.22***
	(0.11)	(0.17)	(0.04)
Which Halal Standards are Included	0.55***	0.22	0.37***
	(0.11)	(0.17)	(0.04)
Benefits of Certification	0.01	0.14	0.06
	(0.11)	(0.17)	(0.04)
N	574	231	3549
Log likelihood	-960.86	-388.49	-6202.82
AIC	1933.7	789.0	12417.6
AIC/N	3.369	3.415	3.499

Note: *** indicates p < 0.01, ** indicates p < 0.05, and * indicates p < 0.1. Base attribute normalized to zero is Inspection Type/Frequency.

Table 41: Best-Worst Scaling Shares of Preferences for Hypothetical U.S. National Halal Meat and Poultry Certification Program: Consumers, Retailers, & Processors: Multinomial Logit

National Halal Meat & Poultry Certification Program Attribute	Processors (n = 82)		Retailers (n = 33)		Consumers (n = 507)	
	Share	95% CI	Share	95% CI	Share	95% CI
Cost of Certification	0.18***	[0.15, 0.20]	0.18***	[0.14, 0.22]	0.11***	[0.10, 0.11]
Enforcement and Regulation	0.13***	[0.11, 0.15]	0.11***	[0.08, 0.13]	0.13***	[0.12, 0.13]
Information Collected/Available	0.07***	[0.06, 0.09]	0.08***	[0.06, 0.10]	0.12***	[0.11, 0.12]
Who/What Must be Certified	0.20***	[0.18, 0.23]	0.22***	[0.18, 0.27]	0.17***	[0.16, 0.18]
Inspection Frequency and Type	0.11***	[0.10, 0.13]	0.12***	[0.10, 0.15]	0.14***	[0.13, 0.14]
Which Halal Standards are Included	0.19***	[0.17, 0.22]	0.15***	[0.12, 0.19]	0.20***	[0.19, 0.21]
Benefits of Certification	0.11***	[0.10, 0.13]	0.14***	[0.11, 0.17]	0.14***	[0.14, 0.15]

Note: *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

Table 42: P-values from Poe tests for Hypothetical U.S. National Halal Meat and Poultry Certification Program: Pair-wise Comparisons Between Processors (n = 82), Retailers (n = 33), and Consumers (507), Multinomial Logit

National Halal Meat & Poultry Certification Program Attribute	Processors vs. Retailers	Processors vs. Consumers	Retailers vs. Consumers
Cost of Certification	0.54	**0.00**	**0.00**
Enforcement and Regulation	**0.05**	0.35	0.94
Information Collected/Available	0.40	1.00	1.00
Who/What Must be Certified	0.19	**0.01**	**0.00**
Inspection Frequency and Type	0.26	**0.00**	0.15
Which Halal Standards are Included	0.97	0.32	**0.00**
Benefits of Certification	**0.05**	**0.00**	0.36

Note: Values that are statistically significant at the 5% level or better are bolded.

Table 43: Uncorrelated Random Parameters Logit Results of Best-Worst Scaling for Hypothetical U.S. National Halal Meat and Poultry Certification Program: Processors (n = 82), Retailers (n = 33), and Consumers (n = 507)

Best-Worst Scaling Attributes	Processors Coefficient (st. error)	Retailers Coefficient (st. error)	Consumers Coefficient (st. error)
Cost of Certification	0.80***	0.67***	-0.34***
	(0.15)	(0.23)	(0.05)
Enforcement and Regulation	0.25*	-0.41*	-0.10**
	(0.14)	(0.23)	(0.05)
Information Collected/Available	-0.74***	-0.78***	-0.20***
	(0.14)	(0.23)	(0.05)
Who/What Must be Certified	0.92***	0.92***	0.27***
	(0.14)	(0.22)	(0.05)
Which Halal Standards are Included	0.95***	0.43*	0.49***
	(0.14)	(0.23)	(0.05)
Benefits of Certification	-0.04	0.16	0.07
	(0.14)	(0.22)	(0.04)
McFadden Pseudo R²	0.21	0.21	0.12
N	574	231	3549
Log likelihood	-879.30	-353.08	-6095.59
AIC	1782.6	730.2	12215.2
AIC/N	3.106	3.161	3.442

Note: *** indicates p < 0.01, ** indicates p < 0.05, and * indicates p < 0.1. Base attribute normalized to zero is Inspection Type/Frequency.

Table 44: Best-Worst Scaling Shares of Preferences for Hypothetical U.S. National Halal Meat and Poultry Certification Program: Consumers, Retailers, & Processors: Uncorrelated Random Parameters Logit

National Halal Meat & Poultry Certification Program Attribute	Processors (n = 82)		Retailers (n = 33)		Consumers (n = 507)	
	Share	95% CI	Share	95% CI	Share	95% CI
Cost of Certification	0.20	[0.16, 0.24]	0.21	[0.16, 0.27]	0.10	[0.09, 0.10]
Enforcement and Regulation	0.12	[0.09, 0.14]	0.07	[0.05, 0.10]	0.12	[0.11, 0.13]
Information Collected/Available	0.04	[0.03, 0.05]	0.05	[0.03, 0.07]	0.11	[0.10, 0.12]
Who/What Must be Certified	0.23	[0.19, 0.27]	0.27	[0.20, 0.34]	0.17	[0.16, 0.18]
Inspection Frequency and Type	0.09	[0.07, 0.11]	0.11	[0.08, 0.14]	0.13	[0.13, 0.14]
Which Halal Standards are Included	0.23	[0.19, 0.27]	0.17	[0.12, 0.22]	0.22	[0.21, 0.23]
Benefits of Certification	0.09	[0.07, 0.11]	0.13	[0.09, 0.17]	0.14	[0.13, 0.15]

Note: *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

Table 45: P-values from Poe tests for Hypothetical U.S. National Halal Meat and Poultry Certification Program: Pair-wise Comparisons Between Processors (n = 82), Retailers (n = 33), and Consumers (507), Uncorrelated Random Parameters Logit

National Halal Meat & Poultry Certification Program Attribute	Processors vs. Retailers	Processors vs. Consumers	Retailers vs. Consumers
Cost of Certification	0.57	**0.00**	**0.00**
Enforcement and Regulation	**0.01**	0.68	1.00
Information Collected/Available	0.30	1.00	1.00
Who/What Must be Certified	0.16	**0.00**	**0.00**
Inspection Frequency and Type	0.16	**0.00**	0.06
Which Halal Standards are Included	0.97	0.72	**0.03**
Benefits of Certification	**0.03**	**0.00**	0.19

Note: Values that are statistically significant at the 5% level or better are bolded.

Figure 15: All Output of Correlated Random Parameters Logit Results of Best-Worst Scaling for Hypothetical U.S. National Halal Meat and Poultry Certification Program, Consumers (n = 507)

```
Iterative procedure has converged

Normal exit:  38 iterations. Status=0, F=     .6053561D+04

-----------------------------------------------------------------------

Random Parameters Multinom. Logit Model
Dependent variable              CHOICE
Log likelihood function    -6053.56104
Restricted log likelihood  -6906.03512
Chi squared [ 27](P= .000)   1704.94815
Significance level              .00000
McFadden Pseudo R-squared      .1234390
Estimation based on N =   3549, K =  27
Inf.Cr.AIC  =  12161.1 AIC/N =    3.427
---------------------------------------
           Log likelihood R-sqrd R2Adj
No coefficients -6906.0351  .1234 .1221
Constants only can be computed directly
            Use NLOGIT ;...;RHS=ONE$
At start values -6202.8157  .0241 .0226
Note: R-sqrd = 1 - logL/Logl(constants)
Root Likelihood:Geom. Mean of P^  .1816
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
---------------------------------------
Response data are given as ind. choices
Replications for simulated probs. =1000
Used Halton sequences in simulations.
RPL model with panel has     507 groups
Fixed number of obsrvs./group=        7
Number of obs.=  3549, skipped    0 obs
```

Figure 15 (cont'd)

CHOICE	Coefficient	Standard Error	z	Prob. |z|>Z*	95% Confidence Interval	
	Random parameters in utility functions...........................					
A1	−.34640***	.04825	−7.18	.0000	−.44098	−.25183
A2	−.09280*	.04750	−1.95	.0507	−.18589	.00030
A3	−.20008***	.04678	−4.28	.0000	−.29177	−.10839
A4	.28766***	.04682	6.14	.0000	.19591	.37942
A6	.51522***	.04916	10.48	.0000	.41887	.61157
A7	.06852	.04628	1.48	.1387	−.02219	.15924
	Diagonal values in Cholesky matrix, L...........................					
NsA1	.88157***	.05371	16.41	.0000	.77630	.98683
NsA2	.88719***	.04802	18.47	.0000	.79307	.98131
NsA3	.59115***	.04163	14.20	.0000	.50955	.67274
NsA4	.60445***	.04064	14.87	.0000	.52480	.68410
NsA6	.58399***	.04228	13.81	.0000	.50112	.66685
NsA7	.36926***	.03704	9.97	.0000	.29665	.44186
	Below diagonal values in L matrix. V = L*Lt....................					
A2:A1	−.21233***	.04916	−4.32	.0000	−.30868	−.11598
A3:A1	−.33569***	.04866	−6.90	.0000	−.43106	−.24031
A3:A2	−.29119***	.04222	−6.90	.0000	−.37394	−.20844
A4:A1	−.08463*	.04841	−1.75	.0804	−.17952	.01026
A4:A2	−.28091***	.04249	−6.61	.0000	−.36418	−.19764
A4:A3	.10671***	.03916	2.73	.0064	.02996	.18346
A6:A1	−.13966***	.04991	−2.80	.0051	−.23749	−.04183
A6:A2	−.32461***	.04452	−7.29	.0000	−.41186	−.23735
A6:A3	.21022***	.04121	5.10	.0000	.12946	.29098
A6:A4	.65385***	.04287	15.25	.0000	.56983	.73788
A7:A1	−.38867***	.04841	−8.03	.0000	−.48356	−.29378
A7:A2	−.11276***	.04168	−2.71	.0068	−.19445	−.03106
A7:A3	.31559***	.03918	8.06	.0000	.23880	.39238
A7:A4	.26119***	.03784	6.90	.0000	.18703	.33535
A7:A6	.08272**	.03635	2.28	.0229	.01146	.15397

Figure 15 (cont'd)

```
        |Standard deviations of parameter distributions..................
  sdA1|     .88157***      .05371    16.41  .0000      .77630     .98683
  sdA2|     .91224***      .04805    18.99  .0000      .81807    1.00641
  sdA3|     .73955***      .04251    17.40  .0000      .65623     .82287
  sdA4|     .68031***      .04087    16.65  .0000      .60020     .76041
  sdA6|     .96831***      .04050    23.91  .0000      .88894    1.04769
  sdA7|     .68905***      .04121    16.72  .0000      .60827     .76982
        |Covariances of Random Parameters..............................
 A2:A1|    -.18718***      .03935    -4.76  .0000     -.26430    -.11007
 A3:A1|    -.29593***      .03810    -7.77  .0000     -.37061    -.22125
 A3:A2|    -.18706***      .04227    -4.43  .0000     -.26991    -.10421
 A4:A1|    -.07461*        .04097    -1.82  .0686     -.15491     .00569
 A4:A2|    -.23125***      .03825    -6.05  .0000     -.30623    -.15627
 A4:A3|     .17329***      .03888     4.46  .0000      .09708     .24950
 A6:A1|    -.12312***      .04109    -3.00  .0027     -.20367    -.04258
 A6:A2|    -.25833***      .04053    -6.37  .0000     -.33777    -.17889
 A6:A3|     .26567***      .04215     6.30  .0000      .18307     .34828
 A6:A4|     .52066***      .05060    10.29  .0000      .42148     .61983
 A7:A1|    -.34264***      .03733    -9.18  .0000     -.41580    -.26948
 A7:A2|    -.01751         .04338     -.40  .6865     -.10253     .06751
 A7:A3|     .34986***      .04672     7.49  .0000      .25830     .44143
 A7:A4|     .25612***      .04050     6.32  .0000      .17674     .33551
 A7:A6|     .37631***      .04928     7.64  .0000      .27972     .47290
--------+----------------------------------------------------------------
--
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on Jan 01, 2024 at 09:24:34 PM
------------------------------------------------------------------------------
--


Correlation Matrix for Random Parameters

--------+-----------------------------------------------------
Cor.Mat.|     A1      A2      A3      A4      A6      A7
--------+-----------------------------------------------------
     A1| 1.00000  -.23276  -.45391  -.12440  -.14423  -.56407
     A2|  -.23276  1.00000  -.27727  -.37262  -.29245  -.02786
     A3|  -.45391  -.27727  1.00000   .34443   .37099   .68657
     A4|  -.12440  -.37262   .34443  1.00000   .79037   .54638
     A6|  -.14423  -.29245   .37099   .79037  1.00000   .56400
     A7|  -.56407  -.02786   .68657   .54638   .56400  1.00000
```

Figure 16: All Output of Correlated Random Parameters Logit Results of Best-Worst Scaling for Hypothetical U.S. National Halal Meat and Poultry Certification Program, Retailers (n = 33)

```
Iterative procedure has converged

Normal exit:  21 iterations. Status=0, F=     .3425588D+03


-----------------------------------------------------------------------
--

Random Parameters Multinom. Logit Model
Dependent variable                CHOICE
Log likelihood function       -342.55881
Restricted log likelihood     -449.50524
Chi squared [ 27](P= .000)     213.89288
Significance level                .00000
McFadden Pseudo R-squared        .2379203
Estimation based on N =    231, K =  27
Inf.Cr.AIC  =     739.1 AIC/N =    3.200
----------------------------------------
          Log likelihood R-sqrd R2Adj
No coefficients  -449.5052  .2379 .2197
Constants only can be computed directly
              Use NLOGIT ;...;RHS=ONE$
At start values  -388.4877  .1182 .0971
Note: R-sqrd = 1 - logL/Logl(constants)
Root Likelihood:Geom. Mean of P^  .2270
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
----------------------------------------
Response data are given as ind. choices
Replications for simulated probs. =1000
Used Halton sequences in simulations.
RPL model with panel has      33 groups
Fixed number of obsrvs./group=        7
Number of obs.=   231, skipped    0 obs
```

Figure 16 (cont'd)

```
--------+-----------------------------------------------------------------
--
        |                  Standard               Prob.      95% Confidence
 CHOICE| Coefficient       Error        z      |z|>Z*         Interval
--------+-----------------------------------------------------------------
--
        |Random parameters in utility functions..........................
     A1|    .91392***      .24643      3.71    .0002      .43093   1.39691
     A2|   -.17735         .23345      -.76    .4474     -.63491    .28021
     A3|   -.79397***      .24061     -3.30    .0010    -1.26556   -.32237
     A4|   1.05049***      .23288      4.51    .0000      .59405   1.50692
     A6|    .35458         .23941      1.48    .1386     -.11467    .82382
     A7|    .39813*        .23971      1.66    .0967     -.07168    .86795
        |Diagonal values in Cholesky matrix, L..........................
   NsA1|   1.85616***      .29287      6.34    .0000     1.28215   2.43017
   NsA2|   1.73116***      .26483      6.54    .0000     1.21210   2.25022
   NsA3|   1.08359***      .22861      4.74    .0000      .63552   1.53166
   NsA4|    .23369         .19074      1.23    .2205     -.14015    .60752
   NsA6|    .01543         .19983       .08    .9385     -.37623    .40709
   NsA7|   1.18455***      .22404      5.29    .0000      .74543   1.62367
        |Below diagonal values in L matrix. V = L*Lt....................
  A2:A1|    .56945**       .23733      2.40    .0164      .10430   1.03460
  A3:A1|    .31574         .23456      1.35    .1783     -.14399    .77547
  A3:A2|    .35253         .22054      1.60    .1099     -.07973    .78479
  A4:A1|    .71177***      .23914      2.98    .0029      .24307   1.18047
  A4:A2|    .28354         .20243      1.40    .1613     -.11321    .68029
  A4:A3|   -.09126         .18869      -.48    .6286     -.46109    .27858
  A6:A1|   -.30952         .25500     -1.21    .2248     -.80930    .19026
  A6:A2|    .95030***      .23396      4.06    .0000      .49174   1.40886
  A6:A3|    .63784***      .23022      2.77    .0056      .18662   1.08905
  A6:A4|  -1.66497***      .28356     -5.87    .0000    -2.22074  -1.10919
  A7:A1|   1.32502***      .26996      4.91    .0000      .79592   1.85413
  A7:A2|    .33871         .21834      1.55    .1208     -.08923    .76665
  A7:A3|   -.66067***      .20993     -3.15    .0016    -1.07213   -.24922
  A7:A4|    .92612***      .23406      3.96    .0001      .46738   1.38486
  A7:A6|  -1.00791***      .21907     -4.60    .0000    -1.43727   -.57855
```

Figure 16 (cont'd)

```
        |Standard deviations of parameter distributions..................
  sdA1|     1.85616***        .29287     6.34   .0000     1.28215   2.43017
  sdA2|     1.82241***        .26765     6.81   .0000     1.29784   2.34699
  sdA3|     1.18243***        .22299     5.30   .0000      .74539   1.61948
  sdA4|      .80619***        .23139     3.48   .0005      .35268   1.25971
  sdA6|     2.04403***        .23082     8.86   .0000     1.59164   2.49643
  sdA7|     2.36297***        .20718    11.41   .0000     1.95690   2.76905
        |Covariances of Random Parameters..............................
 A2:A1|     1.05699*         .54743     1.93   .0535     -.01595   2.12993
 A3:A1|      .58607          .47567     1.23   .2179     -.34623   1.51837
 A3:A2|      .79009*         .46112     1.71   .0866     -.11369   1.69387
 A4:A1|     1.32116**        .55949     2.36   .0182      .22458   2.41773
 A4:A2|      .89617*         .47633     1.88   .0599     -.03742   1.82976
 A4:A3|      .22581          .30547      .74   .4598     -.37291    .82452
 A6:A1|     -.57452          .46464    -1.24   .2163    -1.48518    .33615
 A6:A2|     1.46887***       .55642     2.64   .0083      .37831   2.55944
 A6:A3|      .92844**        .40721     2.28   .0226      .13033   1.72656
 A6:A4|     -.39814          .46307     -.86   .3899    -1.30575    .50946
 A7:A1|     2.45946***       .75575     3.25   .0011      .97822   3.94069
 A7:A2|     1.34090**        .60810     2.21   .0274      .14904   2.53275
 A7:A3|     -.17813          .44834     -.40   .6911    -1.05685    .70060
 A7:A4|     1.31586**        .54121     2.43   .0150      .25511   2.37661
 A7:A6|    -2.06715***       .78743    -2.63   .0087    -3.61048    -.52382
--------+----------------------------------------------------------------
--
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on Jan 01, 2024 at 07:44:43 PM
-------------------------------------------------------------------------
--


Correlation Matrix for Random Parameters

--------+-----------------------------------------------------
Cor.Mat.|     A1       A2       A3       A4       A6       A7
--------+-----------------------------------------------------
     A1| 1.00000   .31247   .26703   .88288  -.15143   .56074
     A2|  .31247  1.00000   .36665   .60996   .39432   .31138
     A3|  .26703   .36665  1.00000   .23688   .38414  -.06375
     A4|  .88288   .60996   .23688  1.00000  -.24161   .69074
     A6| -.15143   .39432   .38414  -.24161  1.00000  -.42798
     A7|  .56074   .31138  -.06375   .69074  -.42798  1.00000
```

Figure 17: All Output of Correlated Random Parameters Logit Results of Best-Worst Scaling for Hypothetical U.S. National Halal Meat and Poultry Certification Program, Processors (n = 96)

```
Iterative procedure has converged

Normal exit:  32 iterations. Status=0, F=     .8606388D+03


-------------------------------------------------------------------------
--
Random Parameters Multinom. Logit Model
Dependent variable                CHOICE
Log likelihood function       -860.63878
Restricted log likelihood    -1116.95243
Chi squared [ 27](P= .000)     512.62728
Significance level                .00000
McFadden Pseudo R-squared       .2294759
Estimation based on N =    574, K =  27
Inf.Cr.AIC  =   1775.3 AIC/N =    3.093
----------------------------------------
          Log likelihood R-sqrd R2Adj
No coefficients -1116.9524  .2295 .2222
Constants only can be computed directly
             Use NLOGIT ;...;RHS=ONE$
At start values  -960.8607  .1043 .0958
Note: R-sqrd = 1 - logL/Logl(constants)
Root Likelihood:Geom. Mean of P^  .2233
Warning:  Model does not contain a full
set of ASCs. R-sqrd is problematic. Use
model setup with ;RHS=one to get LogL0.
----------------------------------------
Response data are given as ind. choices
Replications for simulated probs. =1000
Used Halton sequences in simulations.
RPL model with panel has      82 groups
Fixed number of obsrvs./group=        7
Number of obs.=   574, skipped    0 obs
```

Figure 17 (cont'd)

```
--------+---------------------------------------------------------------
--
        |                  Standard              Prob.       95% Confidence
 CHOICE| Coefficient        Error      z     |z|>Z*          Interval
--------+---------------------------------------------------------------
--
        |Random parameters in utility functions..........................
    A1|    .91671***        .15806    5.80   .0000      .60691    1.22651
    A2|    .28945**         .14281    2.03   .0427      .00955     .56935
    A3|   -.81308***        .15676   -5.19   .0000    -1.12032    -.50584
    A4|    .98937***        .14577    6.79   .0000      .70366    1.27509
    A6|    .97008***        .15223    6.37   .0000      .67172    1.26845
    A7|   -.04691           .14636    -.32   .7486     -.33378     .23995
        |Diagonal values in Cholesky matrix, L...........................
  NsA1|   2.09648***        .21355    9.82   .0000     1.67792    2.51503
  NsA2|   1.31529***        .15257    8.62   .0000     1.01627    1.61432
  NsA3|   1.46573***        .15789    9.28   .0000     1.15628    1.77518
  NsA4|    .82066***        .12589    6.52   .0000      .57392    1.06740
  NsA6|   1.31810***        .15276    8.63   .0000     1.01871    1.61750
  NsA7|   1.39940***        .15315    9.14   .0000     1.09923    1.69958
        |Below diagonal values in L matrix. V = L*Lt.....................
  A2:A1|    .53761***       .15864    3.39   .0007      .22669     .84854
  A3:A1|   -.18392          .15577   -1.18   .2377     -.48922     .12138
  A3:A2|    .34598**        .13530    2.56   .0106      .08081     .61115
  A4:A1|   -.28950*         .15286   -1.89   .0582     -.58911     .01011
  A4:A2|    .04337          .12925     .34   .7372     -.20996     .29670
  A4:A3|    .31768***       .12000    2.65   .0081      .08249     .55287
  A6:A1|    .45964***       .16344    2.81   .0049      .13931     .77997
  A6:A2|    .32291**        .13953    2.31   .0206      .04945     .59638
  A6:A3|    .37361***       .12727    2.94   .0033      .12415     .62306
  A6:A4|   -.70761***       .13096   -5.40   .0000     -.96430    -.45093
  A7:A1|   -.74733***       .16135   -4.63   .0000    -1.06356    -.43110
  A7:A2|    .59629***       .13425    4.44   .0000      .33316     .85941
  A7:A3|    .83063***       .13309    6.24   .0000      .56977    1.09149
  A7:A4|   -.16944          .12007   -1.41   .1582     -.40477     .06589
  A7:A6|    .24544**        .12172    2.02   .0438      .00688     .48401
```

Figure 17 (cont'd)

```
        |Standard deviations of parameter distributions..................
  sdA1|     2.09648***        .21355      9.82   .0000      1.67792   2.51503
  sdA2|     1.42092***        .16430      8.65   .0000      1.09890   1.74295
  sdA3|     1.51720***        .15719      9.65   .0000      1.20912   1.82528
  sdA4|      .92742***        .12721      7.29   .0000       .67810   1.17674
  sdA6|     1.64111***        .14855     11.05   .0000      1.34996   1.93225
  sdA7|     1.91084***        .13770     13.88   .0000      1.64094   2.18073
        |Covariances of Random Parameters...............................
 A2:A1|     1.12709***        .38691      2.91   .0036       .36875   1.88543
 A3:A1|     -.38558           .32129     -1.20   .2301     -1.01529    .24414
 A3:A2|      .35619*          .21533      1.65   .0981      -.06585    .77823
 A4:A1|     -.60693*          .31371     -1.93   .0530     -1.22178    .00793
 A4:A2|     -.09859           .19115      -.52   .6060      -.47324    .27605
 A4:A3|      .53389**         .21289      2.51   .0121       .11663    .95114
 A6:A1|      .96363**         .38080      2.53   .0114       .21729   1.70998
 A6:A2|      .67184**         .26875      2.50   .0124       .14509   1.19858
 A6:A3|      .57479**         .23677      2.43   .0152       .11073   1.03885
 A6:A4|     -.58109***        .17591     -3.30   .0010      -.92586   -.23631
 A7:A1|    -1.56676***        .31778     -4.93   .0000     -2.18960   -.94393
 A7:A2|      .38252           .24389      1.57   .1168      -.09549    .86053
 A7:A3|     1.56123***        .33940      4.60   .0000       .89603   2.22643
 A7:A4|      .36703           .22372      1.64   .1009      -.07145    .80552
 A7:A6|      .60279**         .27302      2.21   .0273       .06768   1.13789
--------+------------------------------------------------------------------
--
***, **, * ==>  Significance at 1%, 5%, 10% level.
Model was estimated on Jan 01, 2024 at 08:01:49 PM
--------------------------------------------------------------------------
--


Correlation Matrix for Random Parameters

--------+-----------------------------------------------------
Cor.Mat.|     A1       A2       A3       A4       A6       A7
--------+-----------------------------------------------------
     A1| 1.00000   .37835  -.12122  -.31216   .28008  -.39110
     A2|  .37835  1.00000   .16522  -.07482   .28811   .14088
     A3| -.12122   .16522  1.00000   .37943   .23085   .53852
     A4| -.31216  -.07482   .37943  1.00000  -.38179   .20711
     A6|  .28008   .28811   .23085  -.38179  1.00000   .19222
     A7| -.39110   .14088   .53852   .20711   .19222  1.00000
```

APPENDIX A.4 FARM ANIMAL WELFARE REGULATIONS ADDITIONAL TABLES

Table 46: Stage 1 Legislative Action Decision Outcomes Coefficients

VARIABLES	(1) Ballot Outcome MNL Coefficients	(2) Bill Outcome MNL Coefficients
HENS_PER_1000	<0.001	<-0.001
	(<0.001)	(<0.001)
HOGS_PER_1000	-0.054**	-0.008**
	(0.025)	(0.003)
COUNT_PASSED_PREV	0.049	0.093***
	(0.043)	(0.034)
PREV_LAW	-0.724	0.528
	(0.963)	(0.468)
ALLOW_BALLOT	2.965***	0.367
	(1.086)	(0.428)
TRIFECTA_D	-0.622	0.893*
	(0.580)	(0.505)
TRIFECTA_R	-1.268	-1.719*
	(1.165)	(0.888)
HOUSE%D	0.019	0.044
	(0.041)	(0.032)
SENATE%D	-0.005	-0.013
	(0.039)	(0.026)
CONSTANT	-6.740***	-6.106***
	(1.645)	(1.077)
Observations	980	

Note: Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 47: Out of Sample Stage 1 Accurate Prediction Percentage

	Mean	Standard Deviation
Predicted Outcome Accuracy	0.931	0.218

Note: We used clusters of 45 states in the Stage 1 bootstrap; the remaining 5 states are used for out of sample predictions for each repetition. An accurate prediction is when the real-world outcome matches the overall prediction of the model. As there are three possible outcomes (no action, ballot proposed, bill proposed), the predicted probability for any given outcome must be larger than the remaining two outcomes for it to be considered the model's overall prediction.

Figure 18: K-Density Plots: Ballot Model Residuals (top), Ballot Model R-Squared (middle), and Ballot Model Inverse Mills Ratios (bottom)

K-Density Ballot Model Residuals

kernel = epanechnikov, bandwidth = 0.0262

K-Density Ballot Model R-squared

kernel = epanechnikov, bandwidth = 0.0007

K-Density Ballot Model Inverse Mills Ratio

kernel = epanechnikov, bandwidth = 0.2838
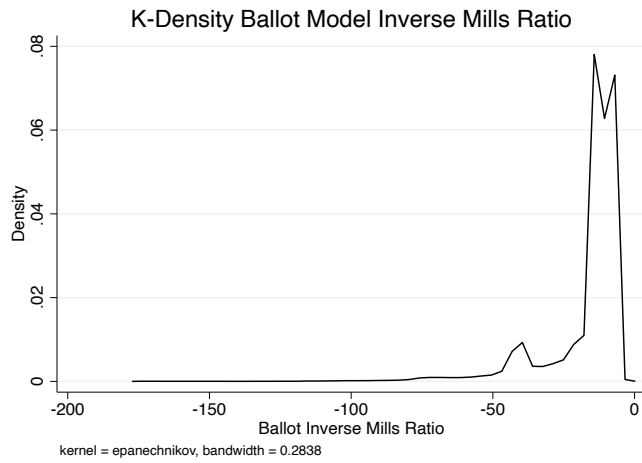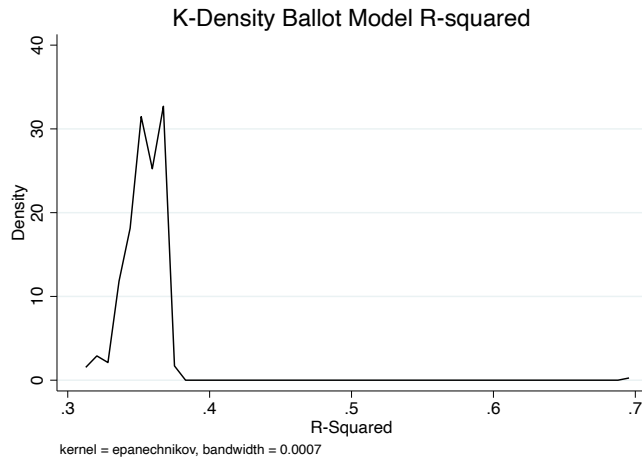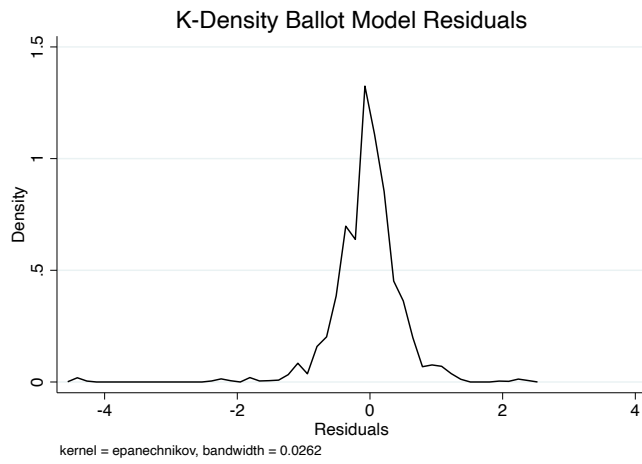
Table 48: Ballot IMR by Year

Year	Mean	Standard Deviation
2000	-12.726	2.826
2001	-12.693	2.835
2002	-12.679	2.695
2003	-12.646	2.720
2004	-12.598	2.788
2005	-12.570	2.788
2006	-12.297	2.766
2007	-12.261	2.570
2008	-12.006	2.566
2009	-11.876	2.620
2010	-12.081	2.630
2011	-12.503	2.756
2012	-12.163	2.767
2013	-12.237	2.789
2014	-12.424	2.719
2015	-12.163	2.546
2016	-12.053	2.804
2017	-12.042	2.886
2018	-11.931	2.843
2019	-11.751	2.525

Table 49: Coefficients with of Percentage of "Yes" Votes as Independent Variable

Variables	(1) OLS Coefficients	(2) Transformed Coefficients
PEOPLE_PER_FARM	0.000***	0.500***
%DEMOCRAT	0.014***	0.504***
%WHITE	0.008***	0.502***
%BLACK	0.001***	0.500***
%HISPANIC	0.008***	0.502***
EDUCATION	-0.009***	-0.498***
POVERTY_RATE	-0.023***	-0.494***
HOUSEHOLD_INCOME_1000	0.002***	0.501***
%CATHOLIC	-0.003***	-0.499***
%EVANGELICAL PROTESTANT	-0.034***	-0.491***
%MAINLINE PROTESTANT	0.030***	0.507***
BALLOT_IMR	0.110***	0.527***
CONSTANT	0.650***	0.657***
Observations	299	

Note: Coefficients in (1) are obtained from cluster bootstrapping. *** p<0.01, ** p<0.05, * p<0.1. To obtain the coefficients in terms of the percentage of "yes" votes from our adjusted model, we must exponentiate to remove the natural log and rearrange terms. The rearranged equation is:

$$V_k = \frac{exp[(IMR \times \phi) + (B' \times \zeta_k)]}{1 + exp[(IMR \times \phi) + (B' \times \zeta_k)]}$$

Equation 23

Table 50: Ballot Model Without MESR and IMRs

VARIABLES	Unadjusted (no IMR) Ballot Model Coefficients
PEOPLE_PER_FARM	<0.001
	(<0.001)
%DEMOCRAT	0.014**
	(0.006)
%WHITE	0.009**
	(0.004)
%BLACK	-0.006
	(0.009)
%HISPANIC	0.008
	(0.005)
EDUCATION	-0.006
	(0.007)
POVERTY_RATE	-0.008
	(0.014)
HOUSEHOLD_INCOME_1000	0.005
	(0.003)
%CATHOLIC	0.004
	(0.004)
%EVANGELICAL PROTESTANT	-0.037**
	(0.016)
%MAINLINE PROTESTANT	0.029***
	(0.010)
CONSTANT	-0.881
	(0.622)
Observations	299
R-squared	0.311

Note: Robust standard errors are in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$. All variables are weighted by county population as a proportion of the total state population.

Table 51: Comparing Real World Outcomes to Ballot Model Predictions

State	Ballot Model	Reality
Alabama	**Fail**	**No regulation in place**
Alaska*	**Pass**	**No regulation in place**
Arizona*	**Fail**	**Regulation in place**
Arkansas*	**Fail**	**No regulation in place**
California*	**Pass**	**Regulation in place**
Colorado*	**Fail**	**Regulation in place**
Connecticut	**Pass**	**No regulation in place**
Delaware	**Pass**	**No regulation in place**
Florida*	**Fail**	**Regulation in place**
Georgia	**Fail**	**No regulation in place**
Hawaii	**Fail**	**No regulation in place**
Idaho*	**Fail**	**No regulation in place**
Illinois*	**Fail**	**No regulation in place**
Indiana	**Fail**	**No regulation in place**
Iowa	**Fail**	**No regulation in place**
Kansas	**Fail**	**No regulation in place**
Kentucky[R]	**Fail**	**Regulation in place**
Louisiana	**Fail**	**No regulation in place**
Maine*[R]	**Pass**	**Regulation in place**
Maryland	**Pass**	**No regulation in place**
Massachusetts*	**Pass**	**Regulation in place**
Michigan*	**Pass**	**Regulation in place**
Minnesota	**Fail**	**No regulation in place**
Mississippi*	**Fail**	**No regulation in place**
Missouri*	**Fail**	**No regulation in place**
Montana*	**Fail**	**No regulation in place**
Nebraska*	**Fail**	**No regulation in place**
Nevada*	**Pass**	**No regulation in place**
New Hampshire	**Pass**	**No regulation in place**
New Jersey[V]	**Fail**	**No regulation in place**
New Mexico	**Fail**	**No regulation in place**
New York	**Fail**	**No regulation in place**
North Carolina	**Fail**	**No regulation in place**
North Dakota*	**Fail**	**No regulation in place**
Ohio*	**Fail**	**Regulation in place**
Oklahoma*	**Fail**	**No regulation in place**
Oregon*	**Pass**	**Regulation in place**

Table 46 (cont'd)

State	Ballot Model	Reality
Pennsylvania	**Fail**	**No regulation in place**
Rhode Island	**Fail**	**Regulation in place**
South Carolina	**Fail**	**No regulation in place**
South Dakota*	**Fail**	**No regulation in place**
Tennessee	**Fail**	**No regulation in place**
Texas	**Fail**	**No regulation in place**
Utah*	**Fail**	**No regulation in place**
Vermont	**Pass**	**No regulation in place**
Virginia	**Fail**	**No regulation in place**
Washington*	**Pass**	**Regulation in place**
West Virginia	**Fail**	**No regulation in place**
Wisconsin	**Fail**	**No regulation in place**
Wyoming*	**Fail**	**No regulation in place**
All 50 States	26%	24%
Ballot States	30.4%	41.7%
Accuracy All 50 States	74%	N/A
Accuracy Ballot States	75%	N/A

Note: States with a (*) are states that allow ballot initiatives. (^{V}) indicates that a FAW law passes by the legislature was vetoed by the governor and is therefore not in effect in reality. Shaded cells correspond to predictions that match what exist in reality. The superscript (^{R}) indicates a state that has a FAW regulation in place that was not passed through a bill or ballot.

APPENDIX A.5 FARM ANIMAL WELFARE DATA COLLECTION METHODS

Stage 1:

State legislature political party information was collected from state legislature websites. In some instances, these websites were incomplete, and these gaps were filled in by the lead author using a range of sources, including Ballotpedia.org, state and local newspapers, and political party websites. Industry size information for egg-laying hens was downloaded from USDA QuickStats and industry size information for gestating sows was downloaded from the Livestock Marketing Information Center (LMIC).

Stage 2:

Votes for State Initiative
Arizona 2006, Proposition 204: Votes on Proposition 204 came from the Arizona's Secretary of State Records for the 2006 General Election (https://apps.azsos.gov/election/2006/General/ElectionInformation.htm). The file "Official Election Results (PDF)" was downloaded on February 8, 2019. Data regarding the voting outcome of Proposition 204, by county, is found on page 15 of the document.
California 2008, Proposition 2: Votes on Proposition 2 came from California's Statement of Vote from the 2008 General Election (https://www.sos.ca.gov/elections/prior-elections/statewide-election-results/presidential-general-election-november-4-2008/statement-vote/). The file "Complete Statement of Vote (PDF)" was downloaded on January 11, 2019. Data regarding the voting outcome of Proposition 2, by county, is found on page 57 of the document.
California 2018, Proposition 12: Votes on Proposition 12 came from California's Statement of Vote from the November 6, 2018 General Election (https://www.sos.ca.gov/elections/prior-elections/statewide-election-results/general-election-november-6-2018/statement-vote/). The file "Complete Statement of Vote (PDF)" was downloaded on February 10, 2019. Data regarding the voting outcome of Proposition 12, by county, is found on page 98 of the document.
Florida 2002, Amendment 10: Votes on Amendment 10 came from Florida's Department of State 2002 General Elections results (https://results.elections.myflorida.com/downloadresults.asp?ElectionDate=11/5/2002&DATAMODE=).
Massachusetts 2016, Question 3: Votes on Question 3 came from Massachusetts' Secretary of the Commonwealth 2016 General Election results (http://electionstats.state.ma.us/ballot_questions/view/2741/).
Ohio 2009, Issue 2: Votes on Issue 2 came from the Ohio's Statement of Vote from the November 3, 2009 General Election (https://www.sos.state.oh.us/elections/election-results-and-data/2009-election-results/state-issue-2-november-3-2009/). The file "State Issue 2 Official Results: November 3, 2009" was downloaded on February 10, 2019.

Votes for State Legislation
California 2010: The record of legislators' votes on this bill came from https://leginfo.legislature.ca.gov/faces/billVotesClient.xhtml?bill_id=200920100AB1437%20
Colorado 2008: The record of legislators' votes on this bill came from http://www.leg.state.co.us/clics/cslFrontPages.nsf/PrevSessionInfo?OpenForm

Michigan 2009: The record of legislators' votes on this bill came from http://www.legislature.mi.gov/(S(45zoivtdskmlve2f2f03jh3a))/mileg.aspx?page=getObject&objectName=2009-HB-5127

Michigan 2018: The record of legislators' votes on this bill came from http://www.legislature.mi.gov/(S(rvjeyosf413g1xjdeb3o32sh))/mileg.aspx?page=GetObject&objectname=2017-SB-0660

Michigan 2019: The record of legislators' votes on this bill came from http://www.legislature.mi.gov/(S(trsczgqyfjcjfrm3ho5b0gni))/mileg.aspx?page=getObject&objectName=2019-SB-0174

New Jersey 2013: The record of legislators' votes on this bill came from https://www.njleg.state.nj.us/bills/BillsByNumber.asp%20

Oregon 2007: The record of legislators' votes on this bill came from https://olis.oregonlegislature.gov/liz/2007R1/Measures/Overview/SB600

Oregon 2011: The record of legislators' votes on this bill came from https://olis.oregonlegislature.gov/liz/2011R1/Measures/Overview/SB805

Oregon 2018: The record of legislators' votes on this bill came from https://olis.oregonlegislature.gov/liz/2019R1/Measures/Overview/SB1019

Rhode Island 2012: The record of legislators' votes on this bill came from http://webserver.rilin.state.ri.us/search/search.idq?CiRestriction=SB+2191&CiMaxRecordsPerPage=25&CiScope=%2FJournals12%2F&CiSort=DocTitle%5Ba%5D&HTMLQueryForm=%2Fsearch%2Fsearch%2Easp&Abstractt=1

Rhode Island 2018: The record of legislators' votes on this bill came from http://webserver.rilin.state.ri.us/journals18/senatejournals18/senatejournals18.html

Washington 2011: The record of legislators' votes on this bill came from https://app.leg.wa.gov/billsummary?BillNumber=5487&Year=2011&Initiative=false

Washington 2019: The record of legislators' votes on this bill came from https://app.leg.wa.gov/billsummary?BillNumber=2049&Year=2019&Initiative=false

Demographic Information

For all data retrieved from the Counties Data File Download website (https://www.census.gov/support/USACdataDownloads.html), all reference codes are found in the file, Mastdata.xls, under "Reference Information Files". The data available closest to the vote in question was used for both counties and legislative districts.

Vote for Democratic Presidential Candidate

Arizona 2006, Proposition 204: Votes for the Democratic ticket, Kerry-Edwards, in the 2004 Presidential election came from Arizona's Secretary of State Record for the 2004 General Election (https://apps.azsos.gov/election/2004/Info/ElectionInformation.htm).

California 2008, Proposition 2: Votes for the Democratic ticket, Obama-Biden, in the 2008 Presidential Election came from the California's Statement of Vote Records for the 2008 General Election (https://www.sos.ca.gov/elections/prior-elections/statewide-%20election-results/presidential-general-election-november-4-2008/statement-vote/).

California 2018, Proposition 12: Votes for the Democratic ticket, Clinton-Kaine, in the 2016 Presidential election came from the California's Statement of Vote Records for the 2016 General Election (https://elections.cdn.sos.ca.gov/sov/2016-general/sov/2016-%20complete-sov.pdf).

Florida 2002, Amendment 3: Votes for the Democratic ticket, Clinton-Gore, in the 1996 Presidential election came from Florida's Department of State records for the November 5, 1996 Abstract of Votes on the November 6, 2012 General Election (https://results.elections.myflorida.com/Index.aspElectionDate=11/5/1996&DATAMODE=).
*Note: The 1996 Presidential election was used opposed to the 2000 Presidential election due to the controversial results in Florida in 2000.
Massachusetts 2016, Question 3: Votes for the Democratic ticket, Clinton-Kaine, in the 2016 Presidential election came from the Massachusetts' Secretary of the Commonwealth results for the 2016 General Election (https://elections.cdn.sos.ca.gov/sov/2016-%20general/sov/2016-complete-sov.pdf).
Ohio 2009, Issue 2: Votes for the Democratic ticket, Obama-Biden, in the 2008 Presidential election came from the Ohio's Secretary of State Results for the November 4, 2008 General Election (https://www.sos.state.oh.us/elections/election-resuls-and-%20data/2008-election-results/).

Median Household Income
Data regarding median household income is found on the "Small Area Income and Poverty Estimates (SAIPE) Program" page on the US Census Bureau website (https://www.census.gov/programs-surveys/saipe.html).

Percent of People all Ages in Poverty
Data regarding poverty is found on the "Small Area Income and Poverty Estimates (SAIPE) Program" page on the US Census Bureau website (https://www.census.gov/programs-surveys/saipe.html).

Persons 25+ years of age with a Bachelor's degree or higher
Education data is found on the USA Counties Data File Download website (https://www.census.gov/support/USACdataDownloads.html).

Race – White, Black, Hispanic
Race data is found on the USA Counties Data File Download website (https://www.census.gov/support/USACdataDownloads.html).

Religious Data – Catholic, Mainline Protestant, Evangelical Protestant
Religious data came from the Association of Religious Data Archives (http://www.thearda.com/QL2010/). Collect data from the "Percent" column for the 2010 religious census.

People per Farm
Information on farm numbers per county was downloaded from USDA QuickStats.

APPENDIX A.6 CALCULATION OF FARM ANIMAL WELFARE INDUSTRY COSTS

Eggs

The calculation of the estimated cost to the egg industry of updating to cage-free egg production in states that do not currently have a FAW regulation in place utilized data from the United Egg Producers (United Egg Producers, 2022), USDA Quick Stats, and Matthews and Sumner (2015). Data from 2017 (the most recent available) on the inventory of egg-laying hens in each state was downloaded from USDA Quick Stats. In five states – Arizona, Connecticut, Delaware, Kansas, and Maine – the number of egg-laying hens was not provided. For these five states, we took the number of egg-laying hens in the nation overall, subtracted the total known from the 45 states that reported inventory numbers, and then divided the unaccounted for inventory evenly between these five states. According to the United Egg Producers, at the end of 2020, 28% of all egg-laying hens were in cage-free systems. We removed the percentage accounted for by the seven states that have a cage-free regulation – California, Colorado, Massachusetts, Michigan, Oregon, Rhode Island, and Washington. We assumed that 100% of the egg-laying hens in these states were in cage-free systems. We then calculated the number of egg-laying hens in cage-free systems in the remaining 43 states without cage-free regulations and computed the new percentage of egg-laying hens in cage-free systems. This updated estimate is 18.32% of egg-laying hens, meaning 81.68% of all egg-laying hens are in conventional housing in the 43 states without a cage-free regulation. This percentage of conventionally housed hens was multiplied by the total inventory in a given state to calculate the number of egg-laying hens in conventional housing.

To estimate the cost of upgrading to cage-free production for these 81.68% of hens, we used estimated changes in cost of producing a dozen eggs under conventional versus cage-free systems from Matthews and Sumner (2015), scaled to the average number of eggs produced per hen in 2020 and inflated to 2022 dollars. According to the United Egg Producers (United Egg Producers, 2022), on average a hen laid 296 eggs in 2020. Converting this number to dozens of eggs, we have the estimated cost of upgrading from conventional to cage-free production per egg-laying hen, which is $6.95 per hen per year in 2022 dollars. We present the predicted percentage of the population within the 31 states not predicted by our model to be likely to pass a FAW regulation, the number of egg-laying hens in those states, the relative size of the states' industry to the national total, and the estimated costs to the industry in each of these states to update to cage-free egg production methods Table 52.

Pork

The calculation of the estimated cost to the pork industry of updating to crate-free pork production in states that do not currently have a FAW regulation in place utilized data from World Animal Protection (World Animal Protection, 2021), the Livestock Marketing Information Center (LMIC), Purdue University's Center for Commercial Agriculture (Langemeier, 2019), and Ortega and Wolf (2018). Data from 2019 (corresponding to the year for the data used in our predictions) on the inventory of gestating sows in each state was downloaded from LMIC.

According to World Animal Protection's "Quit Stalling" report on crate-free pork production (World Animal Protection, 2021), at the end of 2020, about 25% of all gestating sows were in crate-free systems. We removed the percentage accounted for by the eleven states that have a cage-free regulation – Arizona, California, Colorado, Florida, Maine, Massachusetts, Michigan, Ohio, Oregon, Rhode Island, and Washington. We assumed that 100% of the gestating

sows in these states were in crate-free systems. We then calculated the number of gestating sows in crate-free systems in the remaining 39 states without crate-free regulations and computed the new percentage of gestating sows in crate-free systems. This updated estimate is 18.67% of gestating sows, meaning 81.34% of all gestating sows are in conventional housing in the 39 states without a crate-free regulation. This percentage of conventionally housed gestating sows was multiplied by the total inventory in a given state to calculate the number of gestating sows in conventional housing.

To estimate the cost of upgrading to crate-free production for these 81.34% of sows, we used estimated changes in cost per weaned pig under conventional versus two types of crate-free systems from Ortega and Wolf (2018), scaled to the average number of pigs produced per sow in 2019 and inflated to 2022 dollars. According to the Purdue University Center for Commercial Agriculture (Langemeier, 2019), in 2019, on average a sow had two litters of piglets per year, with an average litter size of 11, for an estimated total of 22 piglets per sow per year. Converting to cost per sow, we have the estimated cost of upgrading from conventional to crate-free production per sow, which is between $51.53 and $87.77 per sow per year in 2022 dollars. We present the predicted percentage of the population within the 31 states not predicted by our model to be likely to pass a FAW regulation, the number of gestating sows in those states, the relative size of the states' industry to the national total, and the estimated costs to the industry in each of these states to update to crate-free pork production methods in Table 53.

Table 52: Cost to Update to Cage-Free Egg Production in 31 States not Predicted to Pass a FAW Regulation

State	Percent of Population in Favor of FAW Regulation	Number of Egg-Laying Hens	Percent of Egg-Laying Hens in the Nation	Cost to Update to Cage-Free System
Alabama	21.451	7,867,738	2.137	$44,682,163.73
Arkansas*	34.367	12,285,533	3.336	$69,771,540.05
Georgia	35.904	17,966,521	4.879	$102,034,794.87
Hawaii	38.745	192,185	0.052	$1,091,449.87
Idaho*	42.278	472,192	0.128	$2,681,655.17
Illinois*	46.797	5,470,158	1.485	$31,065,916.96
Indiana	23.841	26,354,377	7.157	$149,670,793.32
Iowa	0.171	56,554,774	15.358	$321,183,759.74
Kansas	5.630	3,249,703	0.882	$18,455,593.01
Louisiana	34.514	1,970,896	0.535	$11,193,038.93
Minnesota	11.274	10,849,607	2.946	$61,616,682.76
Mississippi*	20.817	5,828,262	1.583	$33,099,647.82
Missouri*	11.958	11,306,386	3.070	$64,210,804.99
Montana*	39.778	931,006	0.253	$5,287,334.49
Nebraska*	N/A	7,353,761	1.997	$41,763,204.75
New Jersey	55.172	1,631,775	0.443	$9,267,115.62
New Mexico	38.939	102,020	0.028	$579,388.17
New York	54.224	6,058,141	1.645	$34,405,168.05
North Carolina	10.165	14,160,452	3.845	$80,419,510.00
North Dakota*	12.272	81,364	0.022	$462,079.39
Oklahoma*	0.345	3,354,460	0.911	$19,050,523.92
Pennsylvania	61.928	26,317,523	7.147	$149,461,493.46
South Carolina	25.678	4,002,121	1.087	$22,728,696.07
South Dakota*	0.011	2,708,331	0.735	$15,381,052.24
Tennessee	20.968	1,986,321	0.539	$11,280,640.02
Texas	34.773	21,006,254	5.704	$119,297,932.97
Utah*	52.484	4,480,850	1.217	$25,447,475.93
Virginia	51.360	2,447,718	0.665	$13,900,988.62
West Virginia	39.490	1,215,655	0.330	$6,903,902.46
Wisconsin	48.259	7,639,627	2.075	$43,386,684.26
Wyoming*	5.369	29,550	0.008	$167,819.26
Total	N/A	265,875,261	72.20	$1,509,948,850.89

Note: States with a (*) are states that allow ballot initiatives. The predicted percent of the population in favor of a FAW regulation in Nebraska could not be estimated since Nebraska was left out of the Stage 1 model due to its unicameral state legislature.

Table 53: Cost to Update to Crate-Free Pork Production in 31 States not Predicted to Pass a FAW Regulation

State	Percent of Population in Favor of FAW Regulation	Number of Gestating Sows	Percent of Gestating Sows in the Nation	Cost to Update to Crate-Free System Lower Bound	Cost to Update to Crate-Free System Upper Bound
Alabama	21.451	15,312	0.271	$670,175.71	$1,141,393.00
Arkansas*	34.367	57,816	1.025	$3,895,396.30	$6,634,346.82
Georgia	35.904	21,114	0.374	$1,507,895.34	$2,568,134.25
Hawaii	38.745	2,225	0.039	$83,771.96	$142,674.13
Idaho*	42.278	8,238	0.146	$414,671.22	$706,236.92
Illinois*	46.797	464,442	8.232	$46,702,869.62	$79,540,824.82
Indiana	23.841	280,559	4.973	$20,314,701.14	$34,598,475.37
Iowa	0.171	917,567	16.263	$88,798,281.25	$151,234,572.76
Kansas	5.630	174,810	3.098	$14,827,637.53	$25,253,320.17
Louisiana	34.514	2,018	0.036	$16,754.39	$28,534.83
Minnesota	11.274	572,545	10.148	$50,053,748.16	$85,247,789.83
Mississippi*	20.817	47,797	0.847	$3,727,852.37	$6,348,998.57
Missouri*	11.958	334,240	5.924	$42,388,613.50	$72,193,107.37
Montana*	39.778	20,933	0.371	$2,680,702.83	$4,565,572.01
Nebraska*	N/A	391,551	6.940	$32,210,319.95	$54,858,201.16
New Jersey	55.172	685	0.012	$33,508.79	$57,069.65
New Mexico	38.939	318	0.006	$16,754.39	$28,534.83
New York	54.224	10,923	0.194	$217,807.10	$370,952.73
North Carolina	10.165	896,231	15.885	$78,955,075.55	$134,470,363.04
North Dakota*	12.272	35,147	0.623	$3,057,676.67	$5,207,605.57
Oklahoma*	0.345	425,387	7.540	$36,440,804.10	$62,063,244.48
Pennsylvania	61.928	103,064	1.827	$9,089,258.03	$15,480,142.59
South Carolina	25.678	9,195	0.163	$774,890.66	$1,319,735.66
South Dakota*	0.011	167,015	2.960	$21,319,964.70	$36,310,564.88
Tennessee	20.968	15,466	0.274	$2,282,786.00	$3,887,869.91
Texas	34.773	83,017	1.471	$11,309,215.07	$19,261,006.91
Utah*	52.484	16,842	0.299	$7,036,844.93	$11,984,626.52
Virginia	51.360	8,460	0.150	$280,636.08	$477,958.32
West Virginia	39.490	1,362	0.024	$29,320.19	$49,935.94
Wisconsin	48.259	43,716	0.775	$4,146,712.19	$7,062,369.20
Wyoming*	5.369	16,842	0.299	$3,036,733.67	$5,171,937.04
Total	N/A	5,144,837	91.19	$486,321,379.40	$828,266,099.29

Note: States with a (*) are states that allow ballot initiatives. The predicted percent of the population in favor of a FAW regulation in Nebraska could not be estimated since Nebraska was left out of the Stage 1 model due to its unicameral state legislature.