The effect of information about a complex agricultural supply chain on consumers: The case of beef demand in Mexico

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1. Introduction

- The cattle production industry is an essential part of the US agricultural sector.

- In 2022, the cattle production industry in the US accounted for approximately 17% of the total cash receipts for agricultural commodities ($462 billion).

- The United States is the leading beef producer globally and ranks third in the global beef exporters list.

- The US beef industry faces challenges, including reduced domestic consumption and competition for export markets.

- One way to address these concerns is by promoting US beef more extensively domestically and internationally.

- In 2022, Mexico was the fourth largest US beef export market, accounting for $969.4 million.

- Understanding foreign markets consumers' perceptions and preferences is crucial for promoting US beef products worldwide.
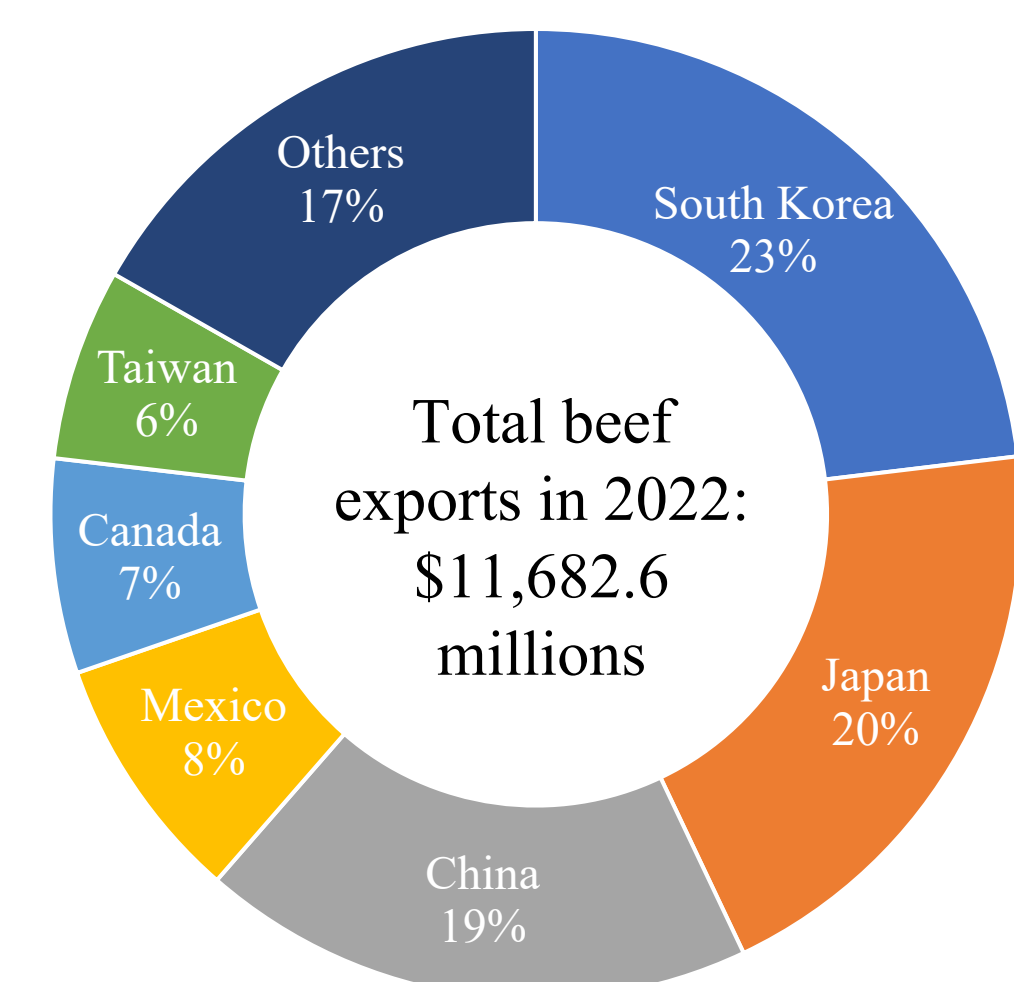
Figure 1. Percent of US beef export markets in 2022
Source: USDA-FAS

Main Objectives:

1) to assess Mexican consumers' preferences for beef produced in single and multiple countries.

2) to evaluate Mexican consumers' preferences for food safety and production practices attributes.

2. Data and Methods

- Data was obtained from an online survey of 2,215 Mexican households in December 2020, conducted by Qualtrics.

The survey collected information about consumers:
1) socio-demographic characteristics
2) beef products consumption and purchase habits
3) perceptions of the importance of various meat products attributes
4) responses to a choice experiment with twelve hypothetical choice scenarios of beef products with different attributes and prices

The choice experiment

The attributes and levels presented in the choice experiment were:
- Country of origin for three stages of production (Born, Raised, and Slaughtered):

United States   Mexico   Canada   Nicaragua

- Price levels (Pesos/kg) 150, 220, 280, and 350.
- Food safety levels: Enhanced and Standard food safety
- Production certification levels: Approved and Natural

Select your preferred option in the boxes below the table (check only one):

Characteristics		Option 1	Option 2	Option 3
Place of origin	Born	U.S.A.	Canada	
	Raised	Mexico	U.S.A.	
	Slaughtered	Mexico	Canada	None
Price/kilogram (Mexican pesos)		350 Pesos	280 Pesos	
Food safety		Enhanced	Standard	
Production practices		Approved	Natural	
I choose…		Option 1 ○	Option 2 ○	Option 3 ○

Figure 2. Example of Choice Experiment Scenario

Data Analysis

The economic framework: The Random Utility Model
The econometric model: The Mixed Logit Model in Willingness to Pay (WTP) Space

3. Descriptive Statistics

Table 1. Description and summary statistics of respondents' characteristics

| Variable and Category	Category Percentage	Mean	Standard Deviation
Age (years)		33.48	9.84
Household size (members)		4.37	6.71
Share of household income spent on food (%)		52.13	18.98
Share of food budget spent on beef (%)		34.00	19.67
Female	61.5%		
Location			
Urban	92.7%		
Rural	7.3%		
Education			
Middle School or below	0.3%		
High school	34.0%		
Professional (Technicians, BS, Graduate Degree)	65.7%		
Monthly household income			
Under 3,000 Pesos	9.4%		
3,000 - 7,999 Pesos	19.8%		
8,000 - 12,999 Pesos	30.2%		
13,000 - 19,999 Pesos	20.4%		
20,000 - 30,000 Pesos	10.1%		
More than 30,000 Pesos	10.1%		
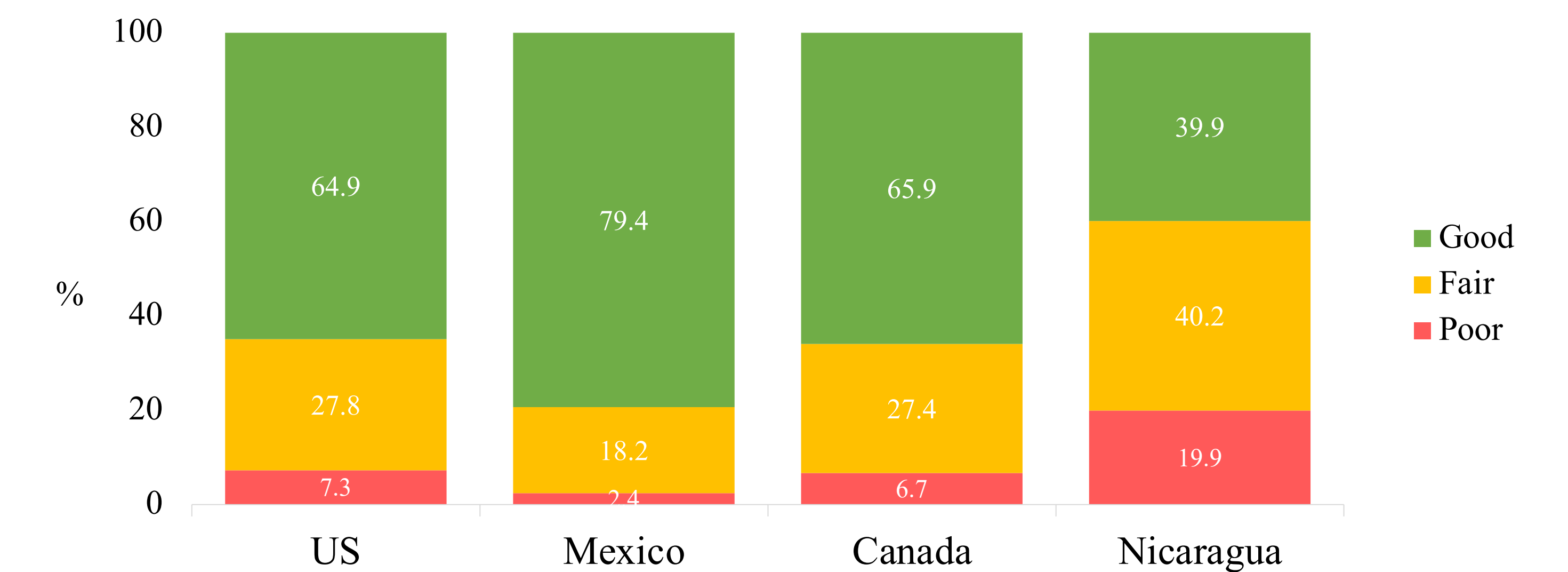
Figure 3. Consumers' perceptions of beef quality by country of origin.

4. Empirical Results

Table 2. Results of the Mixed Logit Model in WTP space for beefsteak ($/lb)

Attributes	Mean coefficients	Standard Deviation coefficients
ASC	-23.148 ***	1.091 ***
Born-US[1]	-1.085 ***	0.197
Born-Canada[1]	-0.708 ***	0.188 ***
Born-Nicaragua[1]	-0.523	0.395 *
Raised-US[1]	-0.125	0.137
Raised-Canada[1]	-0.806 ***	0.233
Raised-Nicaragua[1]	-1.682 ***	0.249 ***
Slaughtered-US[1]	-1.184 ***	0.155 *
Slaughtered-Canada[1]	-1.260 ***	0.209 *
Slaughtered-Nicaragua[1]	-2.940 ***	0.265 ***
Enhanced Food Safety[2]	0.441 ***	0.104 ***
Natural Production practices[3]	1.160 ***	0.144 ***
Number of obs	37,476	
Log likelihood	-10402.304	
Prob > chi2	0.000	

Note: Significance levels: * 10%, **5%, ***1%.
ASC is a dummy variable identifying the alternative specific constant of the no-purchase option of beef steak.
[1] Mexico is the baseline category
[2] Standard food safety level is the baseline category.
[3] Conventional production practices is the baseline category.

5. Conclusions

- Mexican consumers prefer domestically produced beef products.

- There is evidence of heterogeneous preferences among Mexican consumers for the complex supply chain of beef, food safety, and production practices.

- Foreign slaughtering is the production stage with the largest discounts.

- Mexican consumers are willing to pay premiums for enhanced food safety and natural production practices.

- Sharing information on the stages of production could lead to lower discounts for US meat in the Mexican beef market.