

# Roles of Beliefs, Perceived Qualities and Preferences in Formulating Product Choices: International Comparisons

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## Why do people value products differently?

- ▶ WTP for products/product attributes are heterogeneous
- ▶ Economics models attributes heterogeneity to “different preferences”
- ▶ In economics, often use socioeconomic controls as preference shifter
  - ▶ Income, education, gender, etc.
  - ▶ Does not explain much

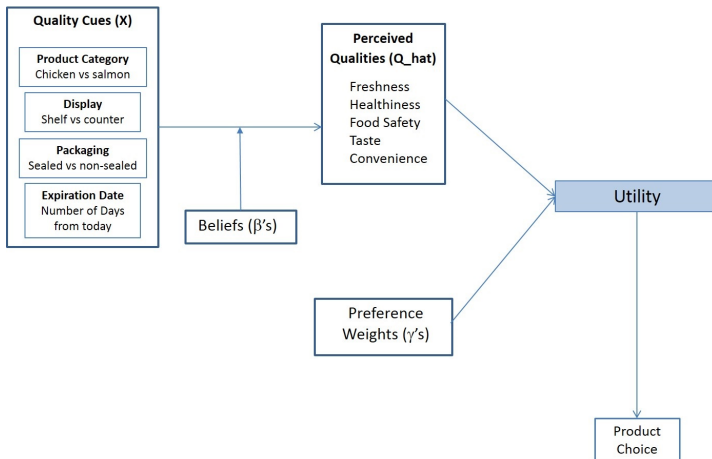
## Explain Heterogeneity in Preferences

- ▶ How do we build models that explain the **mechanisms** behind people's choices?
- ▶ **Beliefs** play a major role (Lusk et al., 2014; Costanigro et al., 2015; Manski, 2004)
  - ▶ Expectation on the delivery of certain qualities from consuming a product
  - ▶ More relevant when qualities are unobservable (experience and credence qualities)
  - ▶ “Objective” measures may be misleading, e.g., individual can adjust their behavior (Teisl and Roe, 2010)

# Objectives

1. Explicitly incorporating subjective beliefs in modeling product choices
2. Gaining insights on how consumer's subjective beliefs about products are affected by market cues
3. Investigating the roles of beliefs and perceptions in the context of choices between chicken and salmon

# Conceptual Framework

[BacktoStandardModel](#)[BacktoQualityModel](#)[BacktoBelief-PreferenceModel](#)

# Utility

- ▶ Consumers derive utilities from consuming  $J$  qualities  $Q_1, Q_2, \dots, Q_J$  :

$$U_i = U_i(Q_1, Q_2, \dots, Q_J, P; \gamma) \quad (1)$$

- ▶ Quality weights:  $\gamma$

## Perceived Qualities

- ▶ True qualities are not observable
- ▶ Consumers use their *subjective beliefs* about the true qualities of a product
- ▶ *Perceived qualities* are then used to formulate utility:

$$U_i = U_i(\hat{Q}_1, \hat{Q}_2, \dots, \hat{Q}_J, P; \gamma) \quad (2)$$

## Quality Cues

- ▶ Perceived qualities are formulated using observable market cues  $X_1, X_2, \dots, X_K$  (Steenkamp, 1990)
- ▶  $\beta$  is a vector of belief parameters that map cues into quality

$$\hat{\mathbf{Q}}' = (\mathbf{X}; \beta) \quad (3)$$



## Back to Utility

- ▶ The estimated perceived qualities can be obtained as  $\hat{\mathbf{Q}}' = (\mathbf{X}; \hat{\beta})$  where  $\hat{\beta}$  = estimated belief parameters
- ▶ Then the utility for a product  $s$  is obtained by plugging in the estimated perceived qualities:

$$U_s = ([\hat{\mathbf{Q}}_s', P_s]; \gamma) \quad (4)$$

# Survey

- ▶ Web-based survey (administered in 2015)
- ▶ Four countries: US, UK, France and Germany
- ▶ Sample of adults ( $N \approx 2,000$  in each country)
  - ▶ Stratified by gender, age composition and geographic area
- ▶ Conjoint choice experiment setting (only with those who eat both chicken and salmon)

# Design

- ▶ Each respondent receives **six** choice tasks
- ▶ Each set contains chicken breasts and salmon fillets with varying cues (attributes)

Table: Attributes

Product	Chicken	Salmon	Condition
Display	Shelf/Counter	Shelf/Counter	
Eat Before Date	3, 5, 14 days	3, 5, 14 days	Only with shelf display
MAP <sup>1</sup>	MAP if 14 days	MAP if 14 days	Implicit
Price (differ by country)	L1,M1,H1	L2,M2,H2	From historic retail prices

<sup>1</sup>Modified Atmosphere Packaging

## MAP Information Treatment

When the "Eat Before Date" is very long, such as 14 days, it is because the product is packed with special technology. One such technology is called Modified Atmosphere Packaging (MAP). In MAP, package is sealed with special mixture of gases instead of normal air. This packaging substantially slows down the processes of food spoilage so that products can stay fresh longer.

A product labeled with MAP is also labeled with a statement "Packed with a protective atmosphere" below the eat before date.

- ▶ Half of the respondents were randomly assigned to the treatment





# Quality Comparisons

Product:	<b>BONELESS SKINLESS CHICKEN BREASTS</b> 	<b>BONELESS SKINLESS SALMON FILLETS</b> 
Sold at:	 <b>Counter</b>	 <b>Shelf</b>
Eat before date:	<b>Fresh from the Counter</b>	<b>3 days</b>

Please tick one product that you think is superior in:

	<i>Chicken</i>	<i>Salmon</i>	<i>They are the same</i>
<i>Freshness</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Good Taste</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Food safety</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Convenience</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Healthiness</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# Product Choice Elicitation

Product:	<div style="border: 1px solid black; padding: 5px; background-color: #e0f2f1;"> <p><b>BONELESS SKINLESS CHICKEN BREASTS</b></p>  </div>	<div style="border: 1px solid black; padding: 5px; background-color: #e0f2f1;"> <p><b>BONELESS SKINLESS SALMON FILLETS</b></p>  </div>
Sold at:	<div style="border: 1px solid black; padding: 5px; background-color: #e0f2f1;">  <p>Counter</p> </div>	<div style="border: 1px solid black; padding: 5px; background-color: #e0f2f1;">  <p>Shelf</p> </div>
Eat before date:	<div style="border: 1px solid black; padding: 5px; background-color: #e0f2f1;"> <p>Fresh from the Counter</p> </div>	<div style="border: 1px solid black; padding: 5px; background-color: #e0f2f1;"> <p>3 days</p> </div>
Price:	<div style="border: 1px solid black; padding: 5px; background-color: #e0f2f1;"> <p>\$5.00/lb</p> </div>	<div style="border: 1px solid black; padding: 5px; background-color: #e0f2f1;"> <p>\$12.50/lb</p> </div>

*If you have to choose one between these products, which would you buy?*

*Chicken*

*Salmon*

*Neither*

# Standard Product Choice Model

- ▶ MAP
- ▶ Predicting product choice with observed product attributes by logit model
- ▶ Shelf display affects product choice positively only in UK
- ▶ 5 days eat before date affects product choice negatively in all countries
- ▶ 14 days eat before date affects product choice positively in US and UK, negatively in France and Germany
- ▶ MAP information was perceived negatively in US but no effect in other countries
- ▶ Results Table

## Perceived Qualities

- ▶ MAP
- ▶ Rank ordered logit on quality comparisons
- ▶ Shelf display reduces freshness, taste, safety and healthiness perceptions but enhances convenience perception (except for France)
- ▶ Longer shelf life tends to reduce the perception of freshness but somewhat increases perceived convenience
- ▶ Salmon is considered healthier but less convenient (US, UK and Germany)
- ▶ Mixed perceptions about Freshness, Taste and Safety between chicken and salmon
- ▶ MAP information reduces perceived freshness in US and Germany
- ▶ US UK France Germany



## Correlations of Quality Dimensions

- ▶ Quality dimensions are highly correlated
- ▶ Convenience is negatively correlated—consumers think that convenient products are less fresh, tasty and healthy
- ▶ French consumers see convenience as NOT opposing to other quality dimensions

Table: Correlation of Quality Dimensions US

	Freshness	Taste	Food Safety	Convenience
Taste	0.9603			
Food Safety	0.9949	0.9402		
Convenience	-0.5137	-0.6097	-0.5219	
Healthiness	0.7063	0.8538	0.6861	-0.8308

## Quality Factors

- ▶ Combine quality dimensions to create factors
- ▶ US: Factor 1 (Fresh, Taste, Safety) Factor 2 (-Convenience, Health)
- ▶ UK: Factor 1(Fresh, Taste, Safety) Factor 2 (-Convenience, Health)
- ▶ France: Quality (Fresh, Taste, Safe, Convenience, Health)
- ▶ Germany: Quality (Fresh, Taste, Safe, -Convenience, Health)

# Product Choice Model with Perceived Qualities

- ▶ MAP
- ▶ Perceived Freshness, Taste and Food Safety positively affect purchases
- ▶ Consumers to some degree sacrifice healthiness to gain convenience (except for in France)
- ▶ Estimation Results

## Conclusion

1. Our two-step elicitation provides insights on the mechanisms of product choices through implicitly considering subjective beliefs
2. Shelf display (compared to counter) and longer shelf life reduce perceived freshness, safety and taste but gain perceived convenience
3. In US, UK and Germany, convenient products are also considered not fresh, tasty, or healthy—implied trade-offs
4. Salmon is considered healthier but less convenient than chicken (US, UK and Germany)
5. French consumers see all the quality dimensions as complementary (no trade-offs)

## Literature

- Costanigro, M., Deselnicu, O., and Kroll, S. (2015). Food Beliefs: Elicitation, Estimation and Implications for Labeling Policy. *Journal of Agricultural Economics*, 66(1):108–128.
- Lusk, J. L., Schroeder, T. C., and Tonsor, G. T. (2014). Distinguishing beliefs from preferences in food choice. *European Review of Agricultural Economics*, 41(4):627–655.
- Manski, C. F. (2004). Measuring Expectations. *Econometrica*, 72(5):1329–1376.
- Steenkamp, J.-B. E. M. (1990). Conceptual Model of the Quality Perception Process. *Journal of Business Research*, 21:309–333.
- Teisl, M. F. and Roe, B. E. (2010). Consumer willingness-to-pay to reduce the probability of retail foodborne pathogen contamination. *Food Policy*, 35(6):521–530.

# Product Choice Logit Estimation Results

	United States	United Kingdom	France	Germany
Shelf	0.108 (0.074)	0.351*** (0.073)	0.028 (0.060)	-0.002 (0.059)
Shelf × info	-0.160*** (0.075)	-0.056 (0.071)	0.041 (0.061)	-0.022 (0.064)
5 days	-0.226*** (0.080)	-0.640*** (0.084)	-0.715*** (0.069)	-0.687*** (0.070)
14 days	0.319*** (0.076)	0.192*** (0.072)	-0.120*** (0.050)	-0.105** (0.051)
14 days × info	-0.410*** (0.100)	0.037 (0.090)	0.021 (0.045)	-0.051 (0.046)
Price	-0.148*** (0.019)	-0.027 (0.028)	-0.165*** (0.026)	-0.133*** (0.025)
Chicken Const	0.119 (0.103)	1.036*** (0.096)	0.087 (0.083)	0.110 (0.080)
Observations	12948	14954	18598	16392

# Quality Comparison Rank Ordered Logit US

	Freshness	Taste	Safety	Convenience	Healthiness
Shelf	-0.653*** (0.053)	-0.224*** (0.049)	-0.248*** (0.047)	0.133*** (0.048)	-0.204*** (0.048)
5 days	-0.005 (0.046)	-0.045 (0.043)	0.031 (0.042)	0.007 (0.041)	-0.027 (0.043)
14 days	0.126*** (0.051)	0.007 (0.050)	0.059 (0.048)	0.041 (0.048)	0.008 (0.050)
14 days × Info	-0.245*** (0.073)	-0.087 (0.069)	-0.071 (0.067)	-0.014 (0.066)	-0.160*** (0.069)
Shelf × Info	-0.109* (0.065)	-0.124** (0.059)	-0.026 (0.057)	-0.044 (0.057)	-0.126** (0.059)
Chicken ASC	0.119*** (0.020)	-0.019 (0.019)	0.043** (0.018)	0.123*** (0.018)	-0.221*** (0.019)

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# Quality Comparison Rank Ordered Logit UK

	Freshness	Taste	Safety	Convenience	Healthiness
Shelf	-0.549*** (0.050)	-0.207*** (0.046)	-0.094** (0.045)	0.083* (0.045)	-0.145*** (0.046)
5 days	-0.159*** (0.043)	-0.077* (0.041)	-0.028 (0.040)	0.066* (0.040)	-0.099*** (0.041)
14 days	-0.009 (0.049)	-0.052 (0.048)	-0.011 (0.046)	0.099** (0.046)	-0.068 (0.048)
14 days × Info	-0.052 (0.063)	-0.033 (0.060)	0.009 (0.059)	0.027 (0.059)	-0.060 (0.061)
Shelf × Info	-0.023 (0.060)	-0.050 (0.055)	0.030 (0.053)	0.032 (0.054)	-0.016 (0.054)
Chicken ASC	0.025 (0.019)	-0.060*** (0.018)	-0.035** (0.017)	0.086*** (0.017)	-0.256*** (0.018)

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# Quality Comparison Rank Ordered Logit France

	Freshness	Taste	Safety	Convenience	Healthiness
Shelf	-0.630*** (0.046)	-0.385*** (0.043)	-0.184*** (0.042)	-0.145*** (0.042)	-0.248*** (0.042)
5 days	-0.115*** (0.040)	-0.065* (0.038)	-0.032 (0.037)	-0.021 (0.037)	-0.070* (0.037)
14 days	-0.070 (0.045)	-0.021 (0.044)	0.009 (0.042)	0.010 (0.043)	-0.054 (0.043)
14 days × Info	-0.001 (0.058)	-0.045 (0.056)	-0.007 (0.055)	-0.011 (0.055)	-0.009 (0.055)
Shelf × Info	0.021 (0.056)	0.080 (0.052)	0.053 (0.049)	0.021 (0.049)	0.061 (0.050)
Chicken ASC	0.014 (0.017)	-0.095*** (0.017)	0.048*** (0.016)	0.016 (0.016)	-0.026 (0.016)

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# Quality Comparison Rank Ordered Logit Germany

	Freshness	Taste	Safety	Convenience	Healthiness
Shelf	-0.559*** (0.046)	-0.268*** (0.044)	-0.203*** (0.042)	0.089** (0.042)	-0.220*** (0.043)
5 days	-0.139*** (0.040)	-0.120*** (0.039)	-0.033 (0.037)	0.036 (0.037)	-0.126*** (0.038)
14 days	0.003 (0.045)	-0.061 (0.045)	-0.008 (0.043)	0.046 (0.043)	-0.071 (0.045)
14 days × Info	-0.125*** (0.058)	-0.058 (0.058)	-0.005 (0.055)	-0.002 (0.055)	-0.055 (0.057)
Shelf × Info	-0.017 (0.056)	-0.018 (0.053)	0.025 (0.050)	0.036 (0.050)	-0.056 (0.052)
Chicken ASC	0.007 (0.018)	-0.166*** (0.017)	-0.023 (0.016)	0.048*** (0.016)	-0.275*** (0.017)

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# Quality Correlations UK

	Freshness	Taste	Food Safety	Convenience
Taste	0.9603			
Food Safety	0.8750	0.8923		
Convenience	-0.8217	-0.9418	-0.8473	
Healthiness	0.6282	0.7967	0.8255	-0.9034

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# Quality Correlations France

	Freshness	Taste	Food Safety	Convenience
Taste	0.9601			
Food Safety	0.9426	0.8610		
Convenience	0.9890	0.9355	0.9771	
Healthiness	0.9801	0.9849	0.9209	0.9653

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# Quality Correlations Germany

	Freshness	Taste	Food Safety	Convenience
Taste	0.9018			
Food Safety	0.9772	0.9304		
Convenience	-0.9252	-0.9837	-0.9283	
Healthiness	0.7746	0.9700	0.8200	-0.9384

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# Product Choice by Quality

	USA	UK	FR	GE
Price	-0.101*** (0.016)	0.169*** (0.022)	0.014 (0.019)	0.026 (0.018)
Fresh, tasty and safe	0.252*** (0.059)	0.113*** (0.029)	- -	- -
Healthy but inconvenient	-0.386*** (0.086)	-0.462*** (0.064)	- -	- -
High quality	- -	- -	0.165*** (0.019)	0.206*** (0.024)
Chicken constant	-0.540*** (0.199)	0.453*** (0.127)	0.629*** (0.066)	0.698*** (0.066)
Observations	12236	14646	17914	16046

MAP information interacted with quality factors were not significant