	Model	Data	Analysis	References

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

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Background	Data		

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

Background	Data		

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)

Background	Data		
	Obj	ectives	

- 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

Model	Data		

Conceptual Framework



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BacktoStandardModel

BacktoQualityModel

5/30 BacktoBelief-PreferenceMod

Model	Data		
	U	tility	

► Consumers derive utilities from consuming J qualities Q₁, Q₂, · · · , Q_J :

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

• Quality weights: γ



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:

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

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Model	Data		
	Quali	ty Cues	

- Perceived qualities are formulated using observable market cues X₁, X₂, ··· X_K (Steenkamp, 1990)
- β is a vector of belief parameters that map cues into quality

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

Model	Data		
	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:

$$U_{s} = ([\hat{\hat{\mathbf{Q}}}_{s}, P_{s}]; \gamma)$$
(4)

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	Data		
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	5	urvey	

- Web-based survey (administered in 2015)
- ► Four countries: US, UK, France and Germany
- ► Sample of adults (N≈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)

	Data		
	D	esign	

- Each respondent receives six choice tasks
- Each set contains chicken breasts and salmon fillets with varying cues (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^1	MAP if 14 days	MAP if 14 days	Implicit
Price (differ by country)	L1,M1,H1	L2,M2,H2	From historic retail prices

Table: Attributes

¹Modified Atmosphere Packaging

	Data		

MAP Information Treatment

When the "Eat Before Data" 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

	Data		

Quality Comparisons



Please tick one product that you think is superior in:

	Chicken	Salmon	They are the same
Freshness			
Good Taste			
Food safety			
Convenience			
Healthiness			

-

	Data		

Product Choice Elicitation



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

Chicken	Salmon	Neither

	Data	Analysis	

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

Background	Model	Data	Analysis	Conclusion	References
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Perceived Qualities



- 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

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 MAP information reduces perceived freshness in US and Germany

US UK France Germany

	Data	Analysis	

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

	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

Table: Correlation of Quality Dimensions US





- 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)

	Data	Analysis	

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

	Data		Conclusion	
	Con	clusion		
	CON	CIUSION		

- 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.

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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 Logiot Estimation Results

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



Quality Comparison Rank Ordered Logit US

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

Quality Comparison Rank Ordered Logit UK

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

Quality Comparison Rank Ordered Logit France

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

Quality Comparison Rank Ordered Logit Germany

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

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

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

MAP information interacted with quality factors were not significant