Using Linked Household-level Datasets to Explain Consumer Response to BSE in Canada

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BACKGROUND

• Bovine Spongiform Encephalopathy (BSE) linked to variant Creutzfeldt-Jakob Disease (vCJD) in humans

• BSE first identified in Canada May 20, 2003

• No deaths in humans yet linked to Canadian BSE events

• 13 cases investigated from 2002 to 2008 in Canada

PURPOSE AND HYPOTHESES

"Who you are" did not explain consumer behavior in previous studies, "What you think" and "What else you do" may be the keys to understand individual choices

Hypotheses:
•Self-reported attitudinal surveys should predict responses to BSE in actual meat purchase behavior spanning several years
•Purchase of value-added foods (here, eggs) is assumed to be a proxy for health concerns
•Consumers who regularly purchased other value-added foods with health or animal welfare attributes should react more strongly to BSE

DATA DESCRIPTION

Nielsen Homescan data, household-level meat purchases, 2002 – 2008

Nielsen Homescan data, household-level egg purchases, 2002 – 2005
• measure the demand for value-added products
• appear the willingness-to-pay for health attributes

Food Opinion Survey in 2008
• nutritional priorities
• general and specific food safety concerns
• trust in government and food industry decision makers

of households in each data set

	Meat	Egg	Food Opinion Survey
Alberta	385	2,644	527
Ontario	312	4,874	1,077

of households/observation in merged data set

	Meat/Egg/Survey
Alberta	143/7,406
Ontario	140/9,076

EMPIRICAL METHODS

Modeling
• The data are repeated observations of each household up to 79 months, 2002-2008
• Panel data models control for observed explanatory variables over time
• Random effects models control for unobserved, time-invariant aspects that affect all of the observations over time of a household in choosing whether and how much beef to purchase.
• Random effects explained 25% of the variance of the number of beef purchases and the quantity of beef purchased.

1. Panel logit model of whether any beef was purchased by household i in a month

$$\ln L(\beta) = \sum_{i=1}^{n} \left[y_i \ln(F(x_i'\beta)) + (1 - y_i) \ln(1 - F(x_i'\beta)) \right]$$

where F(.) denotes the c.d.f of the logit model.

The c.d.f of the logit model is: $F(u) = \dfrac{e^u}{1 + e^u}$

2. Panel Negative Binomial count data model (NB) of quantity consumption with random effects α.

$$lnL(\alpha, \beta) = \sum_{i=1}^{n} \left\{ \left(\sum_{j=0}^{y_i - 1} ln(j + \alpha^{-1}) \right) - lny_i! - (y_i + \alpha^{-1}) ln\left(1 + \alpha \, exp(x_i'\beta)\right) + y_i ln\alpha + y_i x_i'\beta \right\}$$

3. Panel data linear regression model of expenditures

RESULTS

• In Alberta, consumers who purchased value-added eggs reacted significantly more negatively to the second and third BSE events.
• In Ontario, consumers who purchased value-added eggs reacted significantly more positively to the first and second BSE events but negatively to the third one.
• In both areas, households level of trust that manufacturers have sufficient knowledge to control the food safety and to take good care of food safety affect consumers beef purchases but differently. Knowledge has a negative effect, safety has a positive effect: households react positively only when they trust manufacturers to consider safety.

Factor Analysis of Food Opinion Survey (113 questions)

• Several sets of questions provided similar information
• Factor analysis was applied to conserve the degrees of freedom
• Some support the weighted average as the index while two concepts were involved in some questions.
• Manufacturer index1 = manufacturer has sufficient knowledge to control the safety of food products
• Manufacturer index2 = manufacturer takes good care of the food safety given they are well informed

Key Independent Variables:

• BSE event dummy variables: month of discovery plus 4 subsequent months
• Seasonality, age and education of household head
• Interaction variables between conventional and value-added egg and BSE events
• Interaction variables between income, presence of children and BSE events
• Interaction variables between survey questions and BSE events

BSE event 1 represented by May-September,2003; BSE event 2 was January-May,2005 and the third event was January,2006-December,2008

Interaction between valueadded egg preference and BSE events				Interaction between the manufacturers trust and BSE events			
model	regressors	Alberta	Ontario	model	regressors	Alberta	Ontario
whether beef purchased	egg*BSE1	+	-	whether beef purchased	trust 1*BSE1	-	+
	egg*BSE2	- **	+ **		trust 2*BSE1		
	egg*BSE3	- *	+		trust 1*BSE2		
beef units purchased	egg*BSE1		-		trust 2*BSE2	- **	+ **
	egg*BSE2	- *	+ *		trust 1*BSE3		
	egg*BSE3	-	+		trust 2*BSE3	+	+
beef expenditures	egg*BSE1	+	-	beef units purchased	trust 1*BSE1		
	egg*BSE2	+	-		trust 2*BSE1		
	egg*BSE3	-	+		trust 1*BSE2		
					trust 2*BSE2	+	+
Interaction between BSE risk to the family and BSE events					trust 1*BSE3		
whether beef purchased	risk *BSE1	+	+		trust 2*BSE3	-	+
	risk *BSE2	+	+	beef expenditures	trust 1*BSE1		
	risk *BSE3	- **	-		trust 2*BSE1		
beef units purchased	risk *BSE1	+	+		trust 1*BSE2		
	risk *BSE2	+ **	+		trust 2*BSE2	+ *	+
	risk *BSE3	- **	-		trust 1*BSE3		
beef expenditures	risk *BSE1				trust 2*BSE3		
	risk *BSE2	+	+ **				
	risk *BSE3						
Interaction between the extent of BSE news and BSE events							
beef units purchased	BSE *BSE1	+	+ **				
	BSE *BSE2	- **	- *				
	BSE *BSE3	-	+				
beef expenditures	BSE *BSE1	+	- *				
	BSE *BSE2	+ **	-				
	BSE *BSE3	+	+ **				

* and ** denote statistical significance of the underlying parameter at .1 and .05 levels respectively

CONCLUSIONS and DISCUSSION

•Robust but unexpected finding of a positive reaction to the first event, which may reflect support of ranchers and an initial view that BSE was more of a trade issue than a food safety issue.
•Purchases of value-added eggs, intended to be a proxy for revealed health and safety preferences, had statistically significant impacts, but evidence of a systematic direction of influence was lacking.
• Significant correlations between the self-reported survey responses at a single time and the same consumers' revealed behavior over several years.