Consumer Preferences for "Raised Carbon Friendly" Beef Products

A Contingent Valuation Approach

Xiaogu Li
Ph.D. Candidate
Department of Agricultural and Resource Economics
The University of Tennessee
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United States Department of Agriculture
National Institute of Food and Agriculture

Outline

- Introduction
- Survey and Data
- Model Framework
- Preliminary Results
- Reference and Acknowledgement

Introduction

- Beef is the most consumed red meat in the U.S.: 67 lbs. per capita (USDA ERS 2005).
- Grass-fed vs. grain-fed: grass-fed is preferred (Umberger et al 2009).
- Grazing and deforestation

Cattle Industry…

- A main source of greenhouse gases (GHG) emissions: methane and nitrogen (USEPA 2010).
- Faces a saturated market of homogeneous products.
- Pressure from regulations (IPCC 2006).

Eco-label as a Policy Tool

- Information provision (Kennedy et al 1994)
  - ENERGY STAR, LEED, USDA Organic etc.
- Certification for prescribed grazing management
- Price premium and sales promotion (e.g. Vanclay et al. 2011)
- Subsidies to farmers

Survey and Data

- A hypothetic labeling program: "Raised Carbon Friendly (RCF)"
- Online choice experiment by GfK® during April and May of 2013
- Total fielded: 1,705.
- Qualified observations: 817.

PROMOTING PRESCRIBED GRAZING

Suppose there was a program providing payments to farmers who adopt prescribed grazing practices. The payments would cover part of the costs of adopting prescribed grazing. The farmers would also receive an annual payment for up to 10 years if they continue to practice prescribed grazing. An independent third party would verify that the farmers had adopted and continued to use prescribed grazing practices. If all beef farmers adopted prescribed grazing practices, total U.S. greenhouse gas emissions could be reduced by as much as 2%.

RAISED CARBON FRIENDLY

Funding for this program would come from beef consumers who are willing to pay additional amounts for beef each year to help offset the costs to adopt prescribed grazing by farmers.

Beef from farms using prescribed grazing practices would be certified and identified by a label on the product, such as the one shown below.

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Survey and Data (cont'd)

- Contigent Valuation method (CV) (McFadden 1994)
- CV bids
  - Respondents reported their annual household beef expenditure (HHBEXP)
  - Each respondent was randomly assigned to a percentage level: 5%, 10%, 20%, 30% and 40%
  - CV bid = (percentage level) x (HHBEXP)

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CV Example

RAISED CARBON FRIENDLY

To help fund the *Raised Carbon Friendly* program, would your household be willing to pay 30% more for beef products certified as coming from farms using prescribed grazing practices?

Estimated Current Annual Beef Expenditures for Your Household	Extra Amount Your Household Would Pay for *Raised Carbon Friendly* Beef Each Year
$1267 to $1690	**$380 to $507**

Select one answer only

○ Yes
○ No

Next

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Model Framework

- Random utility: product attributes (McFadden 1974)
- Binary choices (accept/reject) of the bids
- Sample selection[a] (Heckman 1979)
- Willingness-to-pay (WTP) for RCF label

[a]See Appx. A for model structure

Preliminary Results

- Maximum likelihood estimates (MLE)[a]
- WTPs from other studies

	McCluskey et al. (2005)	Umberger, Boxall and Lacy (2009)	Xue et al. (2010)	Evans et al. (2011)
Estimated WTP (/lbs.)	$3.42 – 5.65	$0.41 more than grain-fed	$1.70 – 2.01	$1.97 – 2.59

- Mean annual payment: $194

[a]See Appx. B for preliminary MLE results of HeckProbit model

Policy Implication

- Abatement cost: less distortion than tax or permits
- Product differentiation

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Questions?

Photo by Chick-fil-A™

Appendix A: Heckman Probit model

- Latent equation, 2nd Stage: "1=Accept the WTP bids, 0=otherwise"

$$y_{Li} = \boldsymbol{x_{Li}\beta} + \mu_{Li}$$

- Selection equation, 1st Stage: "1=Support RCF and willing to pay, 0=otherwise"

$$y_{Li}^{*}Select = \boldsymbol{z_{Li}\gamma} + \xi_{Li}$$

where $\mu_{Li}, \xi_{Li} \sim N(0,1), corr(\mu_{Li}, \xi_{Li}) = \rho$

- Log-likelihood

$$\ln L_{Li} = \sum_{i \in Sy_{Li}=0} \ln\{\Phi_2(\boldsymbol{x_{Li}\beta} + offset_{Li}\beta, \boldsymbol{z_{Li}\gamma} + offset_{Li}\gamma, \rho)\} + \sum_{i \in Sy_{Li}=0} \ln\{\Phi_2(-\boldsymbol{x_{Li}\beta} + offset_{Li}\beta, \boldsymbol{z_{Li}\gamma} + offset_{Li}\gamma, -\rho)\} + \sum_{i \notin S} \ln\{1 - \Phi(\boldsymbol{z_{Li}\gamma} + offset_{Li}\gamma)\}$$

Appendix B: MLE Results of HeckProbit Model

Bidding			Selection		
Variable	*Estimates*	*Z*	*Variable*	*Estimates*	*Z*
bid	-0.01	-4.69	ppage	-0.01	-1.95
ppage	0.01	1.76	inc1000	0.00	1.45
inc1000	0.00	0.07	beefexp	0.00	-0.46
beefexp	0.00	-0.01	black	-0.24	-0.98
black	-0.12	-0.29	HS	0.06	0.23
HS	0.28	0.64	scoll	0.30	1.16
scoll	-0.33	-0.78	bach	0.21	0.77
bach	-0.04	-0.10	female	-0.22	-1.70
female	0.14	0.76	married	0.10	0.66
married	0.36	1.78	pphhsize	0.03	0.41
pphhsize	0.26	1.77	child	-0.42	-1.91
child	-0.46	-1.56	metro	0.12	0.70
metro	-0.39	-1.48	ne	0.05	0.24
ne	-0.30	-1.04	mw	0.01	0.06
mw	-0.18	-0.71	south	0.11	0.64
south	-0.21	-0.89	repub	-0.28	-1.85
repub	0.59	2.38	climate	0.36	4.75
constant	1.23	1.66	fcheaper	-0.33	-4.88
ath-ρ	-12.16	-128.67	govment	0.32	5.24
N	817		fquality	-0.15	-2.32
Censored	613		costpayer	0.15	2.32
Uncensored	204		orgloc	0.27	4.29
Log likelihood	-418.295		donation	0.40	2.84
Chi-sq	16556.21		constant	-0.76	-1.61