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**A Hedonic Pricing Model of Homogenized Peanut Butter in the Presence of the 2009
Salmonella-based Major Product Recall**

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Poster prepared for presentation at the Agricultural & Applied Economics Association's 2012
AAEA Annual Meeting, Seattle, Washington, August 12-14, 2012

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Introduction & Objectives

Food safety is one of the most pressing issues in the food industry. In 2011, foodborne disease outbreaks have been covered in the media for salmonella (August-September 2011, Class I recall of Cargill ground turkey meat), listeria (August-October 2011, Rocky Ford brand Jensen Farms cantaloupes), E. coli O157:H7 (September 2011, Class I recall of Tyson ground beef), E. coli O104:H4 (Summer 2011, likely German organic bean sprouts), and vibrio (September 2011, Washington State unbranded raw oysters). Since 2006, at least 20 separate recalls have taken place, from fresh produce and meats to processed foods, due to salmonella alone.

The focus of this study, salmonella-tainted peanut butter, was deemed a major product recall by the FDA in 2009. It was an "ingredient-driven" recall; jars of peanut butter, such as Jif and Skippy branded products, were not recalled. Hence, it is possible to identify the econometric model proposed in this paper without considering supply side effects. In particular, we use hedonic pricing methods to obtain marginal values for the "homogenized" attribute at key points in time before and after the recall.

Research Methodology

The theory of labeling of credence goods, such as food, beverage, and bio-based products, is summarized and advanced in Roe and Sheldon (AJAE, 2007). The attribute of interest in this study is "homogenized" peanut butter, although we control for many other observable product attributes (Lancaster, JPE, 1966). Empirically and historically, Rosen's (JPE, 1974) hedonic pricing methodology has been extensively applied. Typically just the first stage of his modeling framework has been applied, although some authors have attempted to apply a "corrected" or properly identified second stage as well with the ultimate goal to make welfare estimates. The hedonic pricing models were estimated using The Nielsen Company national weekly scanner data for the grocery store distribution channel from May 24, 2008 to May 14, 2011 as well as data from the FDA and CDC.

Literature Review

Brown and Rosen (Econometrica, 1982); Diamond and Smith (J of Urban Econ, 1985); Mendelsohn (RE Stat, 1984, 1985); Abelson and Markandya (JEEM, 1985); Bartik (JPE, 1987); Epple (JPE, 1987); Kahn and Lang (Int Econ Rev, 1988); Trajtenberg (JPE, 1989); MacKinlay (J of Econ Lit, 1997); Nevo (Econometrica, 2001); Ekeland, Heckman, Nesheim (AER, 2002); Petrin (JPE, 2002); Matzkin (Econometrica, 2003); Ekeland, Heckman, and Nesheim (JPE, 2004); Bajari and Benkard (JPE, 2005); Song (Rand J of Econ, 2007); Berry and Pakes (Int Econ Rev, 2007); Heckman, Matzkin, Nesheim (Econometrica, 2010)

Beron, Murdoch, Thayer, and Vijverberg. "An Analysis of the Housing Market Before and After the 1989 Loma Prieta Earthquake." (Land Econ, 1997)

Caswell. "How Labeling of Safety and Process Attributes Affects Markets for Food." (Ag Res Econ Rev, 1998)

Schlenker and Villas-Boas. "Consumer and Market Responses to Mad Cow Disease." (AJAE, 2009)

Chang, Lusk, and Norwood. "The Price of Happy Hens: A Hedonic Analysis of Retail Egg Prices." (JARE, 2010)

Li, Wailes, McKenzie, Thomsen. "LL601 Contamination and Its Impact on U.S. Rice Prices." (JAAE, 2010)

Empirical Results & Summary

Tested in a variety of ways, the marginal value of the HOMOGENIZED attribute increased in the post-recall time frame. Most of the other parameter estimates were consistent with a priori expectations. Interestingly, marginal values for the ORGANIC and NATURAL attributes increased post-recall, yet decreased for private label goods. More in-store merchandising, hence price discounting, was implemented post-recall.

Comparison of Hedonic Pricing Models

Variable	Pre-Recall		Post-Recall	
	Coef ¹	S.E. ²	Coef ¹	S.E. ²
<i>SIZE</i>	-3.457 ***	0.113	-3.188 ***	0.062
<i>SIZESQ</i>	0.856 ***	0.032	0.762 ***	0.018
<i>HOMOGENIZED</i>	0.325 ***	0.024	0.418 ***	0.014
<i>ORGANIC</i>	0.961 ***	0.023	1.217 ***	0.013
<i>NATURAL</i>	0.204 ***	0.021	0.286 ***	0.011
<i>GLASS</i>	0.558 ***	0.020	0.551 ***	0.011
<i>CREAMY</i>	0.160 ***	0.015	0.108 ***	0.009
<i>LOWSALT</i>	0.165 ***	0.023	0.188 ***	0.012
<i>LOWFAT</i>	0.085 **	0.037	0.153 ***	0.021
<i>LOWSUGAR</i>	-0.105 **	0.045	-0.052 *	0.027
<i>NOSTIR</i>	-0.452 ***	0.069	-0.527 ***	0.046
<i>REGFLAVOR</i>	-0.342 ***	0.023	-0.269 ***	0.012
<i>PRIVLABEL</i>	-0.816 ***	0.014	-0.916 ***	0.008
<i>ANYMERCH</i>	-0.724 ***	0.052	-0.941 ***	0.032
<i>CONSTANT</i>	5.315 ***	0.093	5.027 ***	0.052
Observations	12,990		42,749	
R-squared	0.499		0.559	

¹ Dependent variable: price (\$/pound). ² White's heteroskedasticity-consistent standard errors. Parameter estimates for holiday and seasonality effects available from author. Note: *** 1%, ** 5%, * 10% significance levels.