Consumer Preference and Market Simulations of Food and Non-Food GMO Introductions

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Labeling foods containing genetically modified organisms (GMO) has been a contentious issue among consumers and producers in the US and abroad. While several states have voted to enact mandatory labeling of GM foods[1], on July 29th, 2016 President Obama signed a federal law that nullified all state mandates. As a result, within 2 years all foods will be required to identify if they contain GMOs. Importantly, companies can choose to use a text label, a toll-free phone number or a digital label such as a QR code.

The recent law was intended to be a compromise between groups for and against mandatory labels. Yet, according to popular press reports, it appears that neither side may be satisfied (Charles 2016). Opponents of mandatory labeling suggest that providing such information is unnecessary as current science has yet to identify any negative health effects resulting from consuming GMOs. Consequently, requiring a label could ultimately mislead a consumer regarding the safety of foods they purchase. In addition, such labeling can be costly for consumers (Zilberman et al 2012).

Those in favor of GMO labeling propose that at a minimum, consumers have a right to know whether the food they eat contains GMOs, and that we should abide by the precautionary principle regarding the introduction of GMOs. Taking this a step further, the anticipated long-run outcome of mandatory labeling is that consumers will ultimately reject GMO foods resulting in their ultimate withdrawal from the market.

Given the limited use of GMO labels in the US and the forthcoming national mandate, a practical question is what effect might the introduction of GMO labels have

[1] Connecticut, Maine and Vermont passed GMO labeling mandates, but only Vermont has put their mandate into effect.

on the US market. In a meta-analysis of early studies on GM foods, Lusk et al (2004) found that consumers had a higher valuation for non-GM foods, although there was significant heterogeneity across consumers. Yet it's not clear that labeling GM foods would have an impact on the market. In an experimental study, Heslop (2006) found minimal effect of GM labels. To that point, Noussair et al (2002) found that even in France, a country with strict rules on GMOs, consumers appeared not to notice GMO labels in an experimental auction. Once the label was highlighted, consumers bid significantly less for GM foods. However, given a price discount, consumers were still willing to purchase GM foods. In one of the only studies of revealed preferences, Kalaitzandonakes et al (2005) found that consumers in the Netherlands did not alter their purchases when labels were introduced into their market.

In their assessment of countries with GM labeling policies, Golan and Kuchler (2011) found that overall labels had a small effect on consumer choice, suggesting that labeling was a weak policy tool for changing consumer behavior. In particular, time-constrained consumers often make little use of information and fail to recognize GM labels. Importantly, they also indicate that a strategy to promote non-GM foods would only be feasible if it were affordable to consumers, thus highlighting the price wedge between the less expensive GM foods.

The primary objective of this research is to estimate the potential impact of introducing product information that identifies the presence of genetically modified organisms on consumer demand. To do so, we conduct a conjoint analysis of 1200 consumers in Connecticut, a state that approved labeling GM foods, although never implemented the law. Given the previous research findings on GMO labels, we provide additional contributions.

First, we include 4 different products (fresh tomatoes, tomato plants, geraniums and turf grass) to examine how consumers are affected across different product types. Presumably, they will react differently for goods they ingest. Second, we examine consumer preferences for GMO sold at different marketing channels. Finally, to incorporate the price wedge between GM and non-GM products, we include price differentials between the two groups. Using these various product and market characteristics we simulate market shares for products with no labels, GMO labels and certified GMO labels.

Our simulations reveal products introduced with a certified GMO label acquire market share from products with no label. As price premiums for certified products increases, however, market share returns to products with no labels. Eventually, such price premiums support higher growth for products with no label.

Our results highlight important considerations regarding the impact of GMO labeling on market share outcomes. Specifically, regardless of GMO labeling, price premiums my minimize consumers transitioning from GM to non-GM products. As products are not sold in a vacuum, firms are likely to counter mandatory labeling requirements with other marketing tactics, including price discounts. If the ultimate outcome of anti-GM advocates is to drive out GMOs, the introduction of GM labels is unlikely to cause that to happen.

Materials and Methods

During the summer of 2016, we implemented an online survey to examine consumer preference and knowledge of local, organic, and GMO labeling on food and non-food products. Respondents were obtained from the panel database of Global Market Insite, Inc. (GMI). Panelists were randomly selected to receive an invitation from GMI's panel database. Panelists agreeing to participate were directed to the survey. A total of 1,374 panelists completed the conjoint section of the survey representing a 92% completion rate. The survey was limited to the state of Connecticut given the funding agency's desire to understand the Connecticut (CT) market. However, Connecticut does offer an interesting test case for a variety of reasons. Notably, CT enacted one of the first state-mandated GMO labeling laws in the U.S. (CT General Assembly, 2013). Even though this law, and other state based GMO labeling mandates, have been nullified due to the signing of federal labeling requirements (Radelat, 2016), the fact that CT passed their initial law shows they are at the forefront of the GMO debate. Furthermore, CT has made a commitment to local foods by implementing a plan to increase local food sales to five percent of total food sales by 2020 (CT General Assembly, 2011).

In the survey, we examine consumer preferences for four different products: one-pint of fresh tomatoes (food), a four-inch container tomato plant (non-food, but produce edible product), four-inch container geranium (non-food), and one-pound of grass seed (non-food). Upon taking the survey, respondents were randomly assigned one of the four products to evaluate.

As can be seen in Table 1 (column 1), our sample is fairly representative of the CT population. Our sample's median household income and age of $72,867 and 44 was similar to the CT median income of $70,000 and age of 40 years, respectively (U.S. Census Bureau, 2011; U.S. Census Bureau, 2015). Given standard errors are not provided in the census estimates we cannot statistically compare the two samples. However, in comparing the different treatments (i.e., random assignment to a product) we find very similar demographics across most all treatments.

To examine their preferences, we utilized conjoint analysis (CA) which has been utilized extensively to measure preferences in both fruits and vegetables (Frank et al., 2001; Behe, 2006; Ekelund, Ferqvist, and Tjärnemo, 2007; Darby et al., 2008; Onozaka and McFadden, 2011; Campbell et al., 2010; Campbell, Mhlanga, and Lesschaeve, 2013; Campbell, Mhlanga, and Lesschaeve, 2016) and plants (Behe et al., 2005; Mason et al., 2008; Zagaden et al., 2008; Hall et al., 2010; Behe et al., 2014).

One of the first steps in CA is to identify the products, attributes, and levels to be evaluated. Important attributes identified via the literature were variety, price, retail location, product origin, production practices, and GMO (Table 2). For each product we included four varieties: two highly demanded varieties, one variety with average demand, and a new variety with low demand. For instance, beefsteak and cherry tomatoes are highly demand fresh/plant tomatoes, Brandy Wine has average demand and Sara Black is a relatively new variety with low demand. Variety was the only attribute that had levels substantially different across products. Prices were the same across products and ranged from $0.79 to $4.69. Prices were selected after examining local retail and online product pricing. Retail location levels consisted of mass merchandiser (e.g., WalMart, Target), grocery store, and farmers' market. For geranium and grass seed nursery/greenhouse garden center and home improvement center were used instead of farmers' market and grocery store, respectively. With respect to product origin, attribute levels included no label, New England, Canada, Connecticut, and California. These origins provide varying levels of geography, such as state, regional, and international. Production practices included no label, organic practices but not certified, certified organic, environmentally friendly, and sustainably grown.

Of keen interest to this paper was the impact of GMO labeling on consumer preference. Attribute levels for the GMO attribute included no label, certified GMO free, and GMO free, but not certified. Understanding the distinction between certification and non-certification is critical as many firms will be tasked with deciding whether to spend money to certify or not. Currently only a handful of products are USDA approved and planted, but the list is growing (Johnson, 2015). Tomatoes are one such crop where GMO varieties have been approved, but are not in current production (Johnson, 2015). Furthermore, the USDA has recently approved a GMO grass developed by Scotts Miracle-Gro (Perkowski 2014).

CA requires that respondents evaluate products consisting of one level of each attribute. Given the number of large number of attribute level combinations (5^3x3^2), it would be infeasible for a respondent to evaluate all products derived from the combination of attribute levels. Therefore, a fractional factorial design was used to limit the number of products needed to be evaluated. Within the survey, respondents were asked to evaluate 25 products on a 0-100 willingness to purchase scale (0=extremely unlikely to purchase, 50=neither likely or unlikely, 100=extremely likely to purchase). Products were randomized to limit order bias. After completing the CA experiment, respondents were asked a purchase behavior question about the product they evaluated, followed by local, organic, and GMO purchase and perception questions as well as demographic questions.

CA is based on the theory that overall product valuations are made up of the utility associated with attributes and attribute levels that make up the product (Baker, 1998). A consumer's total product utility can be characterized as:

(1) $U_{im} = V_{im} + \varepsilon_{im}$,

where, U is total produce utility for the m^{th} product of respondent i, V is a vector or product attribute utilities, and ε is a stochastic error term (Lusk and Schroeder, 2004). Utilizing individual regression models, we can obtain part-worth utilities by estimating the following model for each respondent:

(2) $RT_{ki} = \sum_{i=1}^{25} X_k \beta_{ki} + \epsilon_i$

where, RT is the rating of product k of individual i, X is a vector of effects coded attribute levels of product k, β represents a vector of coefficients (i.e., part-worth utilities), and ε is a random error term. Effects coding requires the part-worth coefficients sum to zero, so we can recover the base (left out dummy variable) coefficient by imposing this restriction. Relative importance values can then be calculated as:

(3) $RI_i = (range_i / \sum_{i=1}^{6} range_i) * 100$

where, RI represents the relative importance of the i^{th} attribute, range is the difference between the maximum and minimum coefficients for each attribute (Hair et al. 1998). Relative importance can be thought of as the weight each attribute has on each consumer's buying decision. We present the relative importance of each attribute for our four products (Appendix 1). We further breakdown the distribution of part-worth utilities for GMO labels for the four products in our analysis (Table 3).

Labeling Scenarios

After computing the part-worth utilities, we simulated market shares based on defined scenarios. We applied the first choice model in conjunction with CA as popularized by Bretton-Clark (1992). This technique has been used to simulate market scenarios in mandarin oranges (Campbell et al. 2006), peanuts (Nelson et al. 2005) and peaches (Campbell et al. 2013), among others. The first choice model is based on economic theory in that a consumer will choose the product with the highest utility. Assuming this is the case we can set up a market simulation whereby we add/remove attribute levels to identify market shares based on utility. For our scenarios we are interested in how consumers respond to the introduction of GMO labeling.

Scenario 1: Label introduction with price premium

We first create a base scenario where we hold all attribute levels constant except having products with no label and products with GMO free labels on the market (*base*), and we calculate the market shares. We then compare the market shares if we were to introduce a certified GMO free label in addition to the no label and GMO free label (*certified introduction)*. Finally, we discount the no label price to identify how market share would change at varying price levels of no label (*GMO free premium*).

Scenario 2: Label introduction across marketing channels

For our second scenario, our base market condition assumes a mass merchandiser is selling a non-GMO labeled product only and a farmers' market (nursery/greenhouse garden center for geranium and grass seed) is selling a non-labeled, GMO free, and certified GMO free product. We then proceed to discount the mass merchandiser price to examine the impact of a price reduction on market share.

Results

Scenario 1

In the first scenario, our base market simulation shows that 48% of the market share is for no label versus 52% for GMO free products (Table 4). When we introduce the certified GMO free label for fresh tomatoes, we find that not only does market share for no label products decrease, but market share for GMO free (but not certified) products declines as well by 12%. This highlights the importance of label certification, even among consumers that prefer GMO free products. We find similar results among the other products. Surprisingly, with tomato plants, there is a greater reduction in market share for GMO free than no label products when the certified GMO free product is introduced.

Adding a GMO premium to each of the products provides interesting details regarding how the market could react to the introduction of GMO labels. We start with a 10% premium and increase this by 10 up to 70%. Naturally, the market share shifts back to non-labeled fresh tomatoes as the price premium increases. At a 30% price premium, the no label tomatoes obtain their entire market share back. As a reference point, Consumer Reports found that organic food was 47 percent more expensive on average than non-organic ("The Cost of Organic Good" 2015, March 19, retrieved from http://www.consumerreports.org/cro/news/2015/03/cost-of-organic-food/index.htm). This was for 100 products with a large variation in price premiums, so the reference should be taken lightly. Interestingly, with the price premiums in place, we observe that GMO free and certified GMO now split market share. Thus, even for a low 10% price premium, both GMO products experience a reduction in market share.

We have similar findings for the other products as well: as the GMO price premium increases, no label gains market share and GMO free and certified GMO split market share. With all the other products, the price premium is less than the organic reference of 47%. In the case of geraniums, a 20% price premium is required to restore the market share to the no label product.

Another consideration is how the price premium for GMO products may result in even greater market share for products with no label. With fresh tomatoes a 40% price premium for GMO results in no label tomatoes obtaining the majority market share. With geraniums it is only 30%. For tomato plants and turf, a much larger price premium is required.

Scenario 2

In this scenario, the simulation demonstrates the effect of introducing a certified GMO label into a farmers market supply chain, while the mass merchandiser only sells the no label product (Table 5). Prior to adding price premiums to the GMO products, we find that the initial market shares are heavily in favor of the no label products, even in the farmer market. This result is consistent across all four products. This is surprising given the association of farmers markets with organic and GMO free foods. This finding could be the result of consumers having less exposure to or knowledge of GMO labeled products.

As the price premium increases, the market share for mass merchandiser increases steadily across all products. With tomatoes, the market share of no label sold in a mass merchandiser more than doubles going from 0% to 70% price premium. Alternatively, the market share for tomato plants only grows 14% under the same conditions.

As the price premiums increase, the market share lost by certified GMO is relatively large given its initial values. For instance, certified GMO tomatoes lose half their market share with the full price premium increase. Certified GMO tomato plants lose a quarter of their market share, certified GMO geraniums lose half their market share and certified GMO turf loses over a third of its market share. Interestingly, the

GMO free, but uncertified products do not lose significant market share. This is likely due to the low initial market share.

Finally, the no label products sold in the farmers markets also lose market share when the price premium is added to the GMO products. This is due to the lost utility associated with the farmers markets, which carries over to all products sold in that marketing channel.

Discussion

The findings of the conjoint analysis and subsequent market simulations reveals interesting findings that could have important implications for US retailers as a federal GMO label is introduced. While the introduction of a GMO certified label does gain market share against both the uncertified GMO product and product with no label, marketing characteristics may act to dampen or even reverse these effects. Specifically, an added price premium for GMO products results in a loss of market share. Further, the GMO premium needed to return market share to the no label product is relatively low in most cases. Across distribution channels, we find that the GMO products are not safe guarded, even when offered via farmers markets. The implications suggest that while introducing GMO labels may shift some consumer preferences, that does not mean that retailers cannot respond with the own actions. Ultimately, the introduction of labels may have low impact on the market share for GMO and GMO free foods.

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Tables

Table 1. Demographics by product type.

	Total	Fresh Tomato	Plant Tomato	Geranium	Grass Seed/Sod
age	45.1	45.0	45.0	44.8	44.3
white	81%	81%	79%	85%	81%
black	7%	6%	7%	5%	8%
hispanic	6%	6%	7%	6%	5%
otherrace	7%	8%	7%	5%	6%
male	27%	26%	26%	30%	24%
republican	22%	25%	22%	17%	22%
democrat	29%	28%	28%	28%	35%
independent	38%	38%	39%	43%	33%
otherpolit~l	10%	9%	11%	12%	10%
rural	23%	24%	22%	22%	25%
suburban	64%	63%	65%	64%	64%
urban	13%	12%	13%	15%	11%
hhadultnumb	2.2	2.2	2.3	2.2	2.4
hhkidnumb	0.5	0.5	0.5	0.5	0.5
income	$72,867	$70,355	$75,487	$73,791	$73,074
eduhsorless	20%	21%	20%	23%	19%
edu2yrsome~l	34%	35%	34%	31%	38%
edubach	27%	26%	30%	28%	24%
edugrad	18%	19%	17%	17%	19%
purchfrshtom	87%	89%	--	--	--
purchplant~m	51%	--	52%	--	--
purchgeran	34%	--	--	35%	--
purchseedsod	44%	--	--	--	50%

Table 2. Attributes and Levels for the Conjoint Experiment.

Fresh Tomato (1 pint)

Variety	***Price***	***Retail Location***	***Product Origin***	***Production Practice***	***GMO Label***
brandywine	$0.79	Mass Merchandiser	No Label	No label	No Label
cherry	$ 1.59	Farmer's Market	New England	Organic Practices, not Certified	Certified GMO Free
sarablack	$2.39	Grocery Store	Canada	Certified Organic	GMO Free, not Certified
beefsteak	$3.59		Connecticut	Environmentally Friendly	
	$4.69		California	Sustainably Grown	

Tomato Plant (4 in. container)

Variety	***Price***	***Retail Location***	***Product Origin***	***Production Practice***	***GMO Label***
brandywine	$0.79	Mass Merchandiser	No Label	No label	No Label
cherry	$ 1.59	Farmer's Market	New England	Organic Practices, not Certified	Certified GMO Free
sarablack	$2.39	Grocery Store	Canada	Certified Organic	GMO Free, not Certified
beefsteak	$3.59		Connecticut	Environmentally Friendly	
	$4.69		California	Sustainably Grown	

Geranium (4 in. container)

Variety	***Price***	***Retail Location***	***Product Origin***	***Production Practice***	***GMO Label***
Regal	$0.79	Mass Merchandiser	No Label	No label	No Label
Common	$ 1.59	Nursery/Greenhouse Garden Center	New England	Organic Practices, not Certified	Certified GMO Free
Ivy	$2.39	Home Improvement Store	Canada	Certified Organic	GMO Free, not Certified
Scentleaf	$3.59		Connecticut	Environmentally Friendly	
	$4.69		California	Sustainably Grown	

Grass Seed (1 lb.)

Variety	***Price***	***Retail Location***	***Product Origin***	***Production Practice***	***GMO Label***
Rye	$0.79	Mass Merchandiser	No Label	No label	No Label
KY Bluegrass	$ 1.59	Nursery/Greenhouse Garden Center	New England	Organic Practices, not Certified	Certified GMO Free
Fine Fescue Mix (Shade/Light)	$2.39	Home Improvement Store	Canada	Certified Organic	GMO Free, not Certified
	$3.59		Connecticut	Environmentally Friendly	
	$4.69		California	Sustainably Grown	

Table 3. Distribution of Part-Worth Utilities by Product and Label.

	Fresh Tomato						
	Part-Worth Distribution				Average Part-Worth		
	Positive	Negative	Zero	First-Choice	No Label	GMO Free	Certified GMO Free
No Label	45%	55%	0%	29%	4.1	-3.4	-0.7
GMO Free, not Certified	52%	48%	0%	40%	-5.0	7.2	-2.2
Certified GMO Free	57%	43%	0%	31%	-2.5	-3.3	5.8
	Tomato Plant						
	Part-Worth Distribution				Average Part-Worth		
	Positive	Negative	Zero	First-Choice	No Label	GMO Free	Certified GMO Free
No Label	43%	57%	0%	26%	4.8	-3.7	-1.1
GMO Free, not Certified	55%	45%	0%	38%	-4.2	7.5	-3.3
Certified GMO Free	54%	46%	0%	36%	-3.3	-2.9	6.1
	Geranium						
	Part-Worth Distribution				Average Part-Worth		
	Positive	Negative	Zero	First-Choice	No Label	GMO Free	Certified GMO Free
No Label	39%	61%	0%	21%	4.7	-4.0	-0.6
GMO Free, not Certified	51%	49%	0%	38%	-3.5	6.2	-2.7
Certified GMO Free	60%	40%	0%	41%	-2.0	-2.4	4.4
	Turf						
	Part-Worth Distribution				Average Part-Worth		
	Positive	Negative	Zero	First-Choice	No Label	GMO Free	Certified GMO Free
No Label	42%	58%	0%	23%	5.3	-4.6	-0.8
GMO Free, not Certified	53%	47%	0%	42%	-4.2	7.0	-2.9
Certified GMO Free	56%	44%	0%	35%	-1.9	-3.3	5.2

Table 4. Market Simulation for Scenario 1

	Fresh Tomatoes		
	no label	GMO free	Cert GMO free
Base	48%	52%	--
Certified Introduction	29%	40%	31%
GMO free premium			
10%	30%	35%	35%
20%	41%	29%	30%
30%	48%	26%	26%
40%	54%	23%	23%
47%	**58%**	**22%**	**20%**
60%	61%	20%	19%
70%	63%	18%	18%
	Tomato Plants		
	no label	GMO free	Cert GMO free
Base	43%	57%	--
Certified Introduction	26%	38%	36%
GMO free premium			
10%	23%	37%	41%
20%	32%	34%	34%
30%	38%	31%	31%
40%	42%	30%	28%
47%	**45%**	**28%**	**27%**
60%	49%	26%	25%
70%	52%	25%	24%
	Geraniums		
	no label	GMO free	Cert GMO free
Base	42%	58%	--
Certified Introduction	21%	38%	41%
GMO free premium			
10%	27%	34%	39%
20%	42%	25%	32%
30%	50%	22%	28%
40%	54%	21%	25%
47%	**56%**	**20%**	**24%**
60%	58%	18%	23%
70%	61%	18%	21%
	Turf		
	no label	GMO free	Cert GMO free
Base	43%	57%	--
Certified Introduction	23%	42%	35%
GMO free premium			
10%	23%	41%	36%
20%	33%	38%	30%
30%	39%	34%	26%
40%	44%	31%	25%
47%	**46%**	**30%**	**24%**
60%	50%	27%	22%
70%	52%	26%	22%

Table 5. Market Simulation for Scenario 2

	Fresh Tomatoes			
	Mass Merchandiser	Farmers' Market		
	no label	no label	GMO free	Cert GMO free
GMO free premium				
0%	26%	48%	3%	22%
10%	34%	46%	1%	19%
20%	37%	44%	1%	18%
30%	41%	42%	1%	16%
40%	44%	40%	1%	14%
47%	**48%**	**37%**	**1%**	**14%**
60%	52%	35%	1%	12%
70%	54%	33%	1%	11%
	Tomato Plants			
	Mass Merchandiser	Farmers' Market		
	no label	no label	GMO free	Cert GMO free
GMO free premium				
0%	36%	42%	2%	19%
10%	40%	41%	1%	18%
20%	41%	41%	1%	17%
30%	43%	40%	1%	16%
40%	45%	39%	1%	15%
47%	**46%**	**38%**	**1%**	**15%**
60%	48%	36%	1%	15%
70%	50%	35%	1%	14%
	Geraniums			
	Mass Merchandiser	Farmers' Market		
	no label	no label	GMO free	Cert GMO free
GMO free premium				
0%	37%	39%	3%	22%
10%	43%	37%	2%	18%
20%	50%	33%	2%	16%
30%	54%	30%	2%	15%
40%	56%	29%	2%	14%
47%	**58%**	**26%**	**2%**	**13%**
60%	61%	25%	2%	12%
70%	63%	24%	2%	11%
	Turf			
	Mass Merchandiser	Farmers' Market		
	no label	no label	GMO free	Cert GMO free
GMO free premium				
0%	44%	39%	2%	12%
10%	48%	38%	1%	11%
20%	50%	37%	1%	10%
30%	53%	34%	2%	9%
40%	56%	32%	2%	8%
47%	**58%**	**31%**	**2%**	**8%**
60%	60%	30%	2%	7%
70%	60%	29%	2%	7%

Appendix 1. Comparing Partworth Utilities Across Products and Attributes

Relative Importance		Fresh Tomato	Tomato Plant				Geranium				Turf	
Variety		21.5%	21.7%				17.2%	***			16.9%	***
Price		27.2%	22.7%	***			30.5%	**			25.7%	
Retail Location		11.4%	11.9%				9.8%	**			10.1%	**
Product Origin		16.0%	17.3%	**			16.9%				18.4%	***
Production Practice		14.8%	16.2%	***			16.0%	**			17.9%	***
GMO		9.0%	10.2%	**			9.6%				11.0%	***
Variety					**Variety**				**Variety**			
brandywine		3.48	3.26		Regal		1.62	--	Rye		-2.34	--
cherry		2.53	-0.27	***	Common		-1.62	--	KY Bluegrass		0.54	--
sarablack		-11.03	-8.29	**	Ivy		-0.90	--	Fine Fescue		1.32	--
beefsteak		5.02	5.31		Scentleaf		0.90	--	Mix (Shade/Light)		0.48	--
Price					**Price**				**Price**			
	$0.79	14.19	7.47	***		$0.79	12.53			$0.79	9.51	***
	$1.59	7.43	5.27	**		$1.59	6.11			$1.59	4.74	**
	$2.39	0.60	0.81			$2.39	-0.12			$2.39	0.10	
	$3.59	-8.26	-5.02	***		$3.59	-7.17			$3.59	-5.06	***
	$4.69	-13.96	-8.52	***		$4.69	-11.35	**		$4.69	-9.30	***
Retail Outlet					**Retail Outlet**				**Retail Outlet**			
Mass Merchandiser		-4.13	-1.69	***	Mass Merchandiser		-0.67	***	Mass Merchandiser		-0.55	***
Farmer's Market		3.12	2.57		Nursery/Greenhouse Garden Center		0.47	***	Nursery/Greenhous e Garden Center		0.02	***
Grocery Store		1.01	-0.88	***	Home Improvement Store		0.21	*	Home Improvement Store		0.53	

Appendix 1. Comparing Partworth Utilities Across Products and Attributes, continued

Relative Importance	Fresh Tomato	Tomato Plant		Geranium		Turf	
Product Origin							
No Label	-1.55	-0.86		-0.30	**	-1.29	
New England	2.42	1.44		0.92	**	2.05	
Canada	-3.00	-2.32		-1.91		-1.75	*
Connecticut	4.86	4.53		2.33	***	3.51	**
California	-2.72	-2.78		-1.03	***	-2.52	
Production Practice							
No label	-1.47	-1.18		-0.02	**	-0.96	
Organic Practices, not Certified	-1.29	-2.36		-1.79		-1.49	
Certified Organic	1.54	2.07		0.74		1.08	
Environmentally Friendly	1.20	1.78		0.48		0.99	
Sustainably Grown	0.02	-0.31		0.60		0.38	
GMO							
No Label	-1.61	-1.50		-1.14		-1.18	
Certified GMO Free	0.75	0.64		0.60		0.43	
GMO Free, not Certified	0.86	0.86		0.54		0.74	
Constant	50.73	50.06		57.34	***	46.96	**
R2	0.91	0.87	***	0.88	***	0.87	***
Adj R2	0.56	0.39	***	0.42	***	0.36	***