DOES PRODUCTS LABELING HAVE STIGMA EFFECT ON GMO PRODUCTS

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ABSTRACT

Production labeling is commonly used to convey specific information to customers. With distinctive labels, customers may make different choices due to different labels. Sometimes, consumers may be attracted by attractive introduction on the label, and they increase their willing to pay on this products, while sometimes consumers may decrease their willing to pay on some conventional products because there are some special description on the label. Producers could have a loss because consumers are supposed to lower their willing to pay on some products with conventional labels as well as new labels. In this paper, whether Genetically modified organism(GMO) or non-Genetically modified organism(non GMO) shown on the label of conventional agricultural products stigmatizes consumers' willing to pay. Strawberries and apples are chosen as two groups of conventional products.

Key word: conventional products, strawberries, apples, GMO, stigma effect

BIOGRAPHICAL SKETCH

Xiaolin Zhang is a graduate student at Cornell University, in the field of Applied Economics and Management. She got her Bachelor's degree in Tianjin University of Finance and Economics, majoring in finance. Her research interest includes Behavioral Finance and Corporate Finance, which derived from her previous experience in investment bank and private equity fields. She also has an interest on pension funds.

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CHAPTER 1

INTRODUCTION

When a customer wandering in a supermarket, what is the most important factor for them to choose or not to choose a product among a large amount of similar kind of products? Except for the impact of advertising, labeling can convey information most directly and efficiently to all consumers. Actually, the information consumers can receive from labels is more than imagining. In general, useful information can promote the WTP for consumers, while some characters on the label would stigmatize consumers' willing to pay. For example, people would decrease their WTP for conventional milk because they think rBST may have negative impact on their internal secretion system, even though it has been proved that milk with the addition of rBST basically will not do harm on human.

In this paper, whether GM shows on the labels would decrease consumers' willing to pay is the main topic. In other words, it is of vital importance to analyze the stigma effect on WTP when GM is on the labels. Generally, Genetically modified(GM) organism is not preferred by most consumers these years. In some consumers' viewpoint, GM products may cause many defects on human beings. For instance, they think GM organisms would cause organ damage, gastrointestinal and immune system disorders. In addition, the process of GM organism planting will not increase the production but will be release more contamination to the environment. As a result, many famous food provider, for example, Chipotle, Starbucks, announced that they'll never provide GM food to customers. However, GM products actually are proved that they do no harm on human's health by FDA, but a large amount number of people still deny Genetically modified organisms because they think GM products may have some unproved potential health. Thus, when GM shows on the products' labels, it may stigmatize people's WTP.

In this paper, whether genetically modified organism(GMO) shown on the label stigmatizes consumers' purchasing behavior is the key issue to discussed. A potential bias may contain between customers and agricultural products is described as stigma, which is a psychological phenomenon that people make negative manner on purchasing when there is not enough evidence.

CHAPTER 2

LITERATURE REVIEW

In the debate over genetically modified organisms, many parties have proposed labeling foods with GM ingredients and separating the seeds or gm products from the supply stream. Labels have special appeal, as a substitute for the market, those who believe that consumers, once you know the existence of genetically modified food or seed, will choose to buy (or not buy) based on this information. In fact, the label may be entirely voluntary to provide such information to consumers. However, for various reasons, particularly in the context of consistency and coordination in private companies and national management systems, it is likely to require some international standards or norms.(Runge and Jackson, 2000)

In all western countries, labeling of food products is strictly regulated. Labels are required to be informative in that they must provide the consumer correct and useful descriptions of the characteristics of the products. Character is not allowed to be misleading.(Noussair et. al 2002) Normally, some information shown on the label stigmatizes customers' WTP. For example, consumers would pay more on a rBST milk rather than rBST-free milk. (Christopher Kanter et. al 2014) Consumers' reluctance to embrace GM as a beneficial technology, as well as the presence of conflicting information regarding GM in conventional agricultural products, bears many similarities to consumers' reactions to the use of rBST in milk and other biotechnologies in food productions. (Noussair, Robin et. al 2004)

In other aspect, GM labels also have opportunities for this industry. The five countries that regulate genetically modified organisms -- Canada, the us, Mexico, Japan and the European Union -- all agree that labels play an appropriate role in delivering these new production methods to consumers. Currently, all five countries have introduced the introduction of genetically modified products, but only the EU has established the existence of GMOs. This potential "technical trade barrier" poses challenges for producers, consumers and governments. Mandatory and voluntary labelling schemes have implications for research and commercialization of transgenic products based on processes and products. The analysis concluded that the mandatory labeling would be too costly for the producers of gm products. This result will threaten the research and commercialization of gm products. In contrast, voluntary positive labeling of non-gmo foods, or the presence of specific gm ingredients in goods, will limit producer costs. The results are both commercially and socially optimal.(Phillips et. al, 1998) Some researchers believe that it is necessary to have a clearer labeling policy on gm foods. If gm foods are more clearly identified, consumers will be able to make more education purchase decisions and exercise their beliefs and preferences accordingly.(Wunderlich et. al, 2017)

The research method of this paper is different from other similar researches. There are some main innovation of this paper. First of all, instead of analyzing consumers' specific willing to pay, the data we use in this paper is analyzing the percentage of willingness to purchase different kind of organism. In the past researches, the difference of gender (McFadden and Lusk, 2015), age (Liaukonyte et al., 2013), income (Delwaide et al., 2015) and education (Dannenberg et al., 2011) are all considered to be factors affecting consumers' willing to pay GMO products. In this paper, all interviewers are Cornell students with the similar level of education and no income.

Gender is also not the point of this survey. The only thing matters is whether GMO stigmatizes people's WTP.

Research has shown that women are less accepting of genetically engineered products than men. Also, more knowledge is assumed to lead to more acceptance.(Moerbeek and Casimir, 2005) Food labels are not the only factor that can influence consumers' preferences for GM food products. A broad range of research has demonstrated the importance of key demographic variables including income (Delwaide et al., 2015), age (Liaukonyte et al., 2013), education (Dannenberg et al., 2011), and gender (McFadden and Lusk, 2015) in predicting the consumers' preferences for GM foods. These differences observed across individuals demonstrate the need Consumer Preferences for GM Labeling 6 to account for preference heterogeneity in the analysis of choice data. In this paper, gender and knowledge are ignored, which means they are not control variables

CHAPTER 3

EXPERIMENT METHOD

Experiment Design

An online survey was contributed to 169 students and stuffs in Cornell University. During the

process of survey distributing, all experimental subjects were recruited via email and blackboard

announcements, and these objects don't know that the order of different kind of label existing. In

other words, they don't know there are six sets of different questionnaire existing. Students and

stuffs are mainly from AEM6700 and AEM4150 in Charles H Dyson School of Economics for

extra credits, and samples are independent. The average response time of this survey is 402

seconds. Gender, income, education and age are not considered as indicators to the results.

To analyze whether GMO shown on the label would stigmatize consumers' WTP, three kinds of

agricultural products are used, apples, strawberries and potatoes, while the products included in

the survey were apples, strawberries, potatoes, chardonnay and cabernet sauvignon. Thinking

about most of test objects are under 21 and they are not permitted to take alcohol, the results of

wine(Chardonnay and Cabernet Sauvignon) are not as statistical significant as that of other three

varieties of products(apples, strawberries and potatoes). Apples, strawberries and potatoes are

three of the most approachable commodities in consumers' daily life. Thus, consumers'

percentage WTP for apples, strawberries and potatoes are utilized as the objects of study.

To analyze what the effect on WTP due to different orders of products with distinctive

labels(GM label, not-GM label and no-label) during the survey, products are divided into three

groups regarding to their labels. To eliminate the orders of products with different labels affect

consumers' choices, different orders are set. Due to the different orders of these three kinds of products showing up, there are 6 sets of this questionnaire.

To repeat the procedure to analyze consumers' WTP would bring a more reasonable and accurate result. However, There are many pros of this designation of experiments. First of all, it is less costly to collect data from this survey than collect data from varied prices. Otherwise, respondents are familiar with the products used in the survey. They know the approximate prices of these products and have a basic judgement about the differences of prices among commodities with distinctive labels. The last advantage of this experiment is that the WTPs for three different agricultural products can be combined to get one conclusion.

Before the survey, experiment subjects are given a brief introduction about this survey, but they were not claimed that there are 6 sets of surveys. In the beginning, people are given pictures of three groups of conventional products. In each part, the prices and pictures of agricultural products are given. The differences among three parts are whether the products have no label, a GM label or a not-GM label. Each question is all the same below each picture: do you want to buy this product? There were no brands shown on the label to avoid branding effect. Consumers' choices would not be affected by the preference to brands. The subjects are asked choosing yes or no regarding to whether they would like buy these products in a specific price. The total willingness to pay is calculated by the amount of yes divided by total number of respondents. In total, this experiments have 6 results respectively. After collecting data, it is of vital importance to analyze whether GM label stigmatizes consumers' WTP.

Data Analysis Method

The dummy variables were used in the analysis to present the different order of GM, non-GM and no-labeled products. GM products were labeled as GM, non-GM products were labeled as NG, and no-labeled products were labeled as NO. Thus, if no labeled products presented before

GM products, the dummy variable for this combination is NOGM. Similarly, if no-labeled products shown before non-GM products, the dummy variable is NONG. Thus, the total possibilities for dummy variables are NOGM, NONG, GMNG, GMNO, NGGM, NGNO, and they can be used to measure how the stigma effect works.

Due to the experimental designation, Tobit regression model is used to compare the WTP of different products. The assumption is that $\beta_1 \neq 0$.

The model is :

$Y = \beta_0 + \beta_1 * DV$

Y: Consumers' willing to pay for GM products

First of all, there are different situations existing in the survey processes.

1. Is there any effects when you have no label first? How does this affect GM products?

Create dummy variables = $\begin{cases} 1, \text{ if NO first, GM second} \\ 0, \text{ otherwise} \end{cases}$

Then we use Tobit regression to analyze,

$Y = \beta_0 + \beta_1 * Dum$

When $\beta_1 < 0$, there is existing negative effects on WTP for GM products when no label showing first.

2. Is there any effects when you have no label first? How does this affect GM products?

Create dummy variables = $\begin{cases} 1, \text{ if NO first, NON second} \\ 0, \text{ otherwise} \end{cases}$

Then we use Tobit regression to analyze,

$Y = \beta_0 + \beta_1 * Dum$

When β_1<0, there is existing negative effects on WTP for GM products when no labeled and non-GM products showing first.

3. Is there any effects when you have not-GM first? How does this affect GM products?

Create dummy variables =
- 1, if NON label first, GM second
- 0, otherwise

Then we use Tobit regression to analyze,

$$Y = \beta_0 + \beta_1 \text{Dum}$$

When β_1<0, there is existing negative effects on WTP for GM products when non-GM products showing first.

4. Is there any effects when you have not-GM first? How does this affect no-labeled products?

Create dummy variables =
- 1, if NON first, NO second
- 0, otherwise

Then we use Tobit regression to analyze,

$$Y = \beta_0 + \beta_1 \text{Dum}$$

When β_1<0, there is existing effects on WTP for GM products when non-GM and no labeled products showing first.

RESULTS

The total number of respondents is 169. They are spitted evenly to 6 groups, and the number of respondents in each group is approximately 30 persons. The order of labels and the summary of consumers' willingness to pay are shown in the table 1.

Table 1. Percentage of WTP for No labeled, GM and non-GM products

% of willing to buy
Green shade means lower than average in the label group (No Labe/GM/NotGM)

	# in group		No label-Strawberries	No label-Apples	No label-Potatos	No label-Cab Sauv	No label-Chard	average	GM-Strawberries	GM-Apples	GM-Potatos	GM-Cab Sauv	GM-Chard	average	Not GM-Strawberries	Not GM-Apples	Not GM-Potatos	Not GM-Cab Sauv	Not GM-Chard	average
group 1	30	No_GM_Non	80%	73%	90%	57%	57%	71%	33%	43%	53%	43%	27%	40%	83%	77%	87%	70%	60%	75%
group 2	28	No_Non_GM	68%	68%	93%	79%	79%	77%	36%	46%	54%	46%	43%	45%	75%	82%	93%	75%	68%	79%
group 3	28	GM_Non_No	82%	86%	86%	75%	79%	81%	50%	46%	79%	61%	57%	59%	86%	89%	93%	82%	89%	88%
group 4	30	GM_No_Non	83%	77%	93%	57%	60%	74%	73%	73%	77%	50%	53%	65%	80%	80%	87%	63%	67%	75%
group 5	26	Non_GM_No	88%	96%	85%	65%	77%	82%	42%	46%	46%	42%	38%	43%	81%	85%	77%	73%	69%	77%
group 6	27	Non_No_GM	52%	59%	81%	63%	70%	65%	30%	41%	48%	33%	37%	38%	59%	74%	81%	59%	70%	69%
	169	average	76%	76%	88%	66%	70%	75%	44%	50%	60%	46%	43%	48%	78%	81%	86%	70%	70%	77%

|	No Label	GM	Not GM
Baseline WTB: average as the 1st to be presented	74%	62%	73%

The results are clear and significant. There are 635, 410 and "yes" to purchase no-labeled, GM and non-GM products separately. The number of "yes" to purchase GM products is significantly lower than the number of "yes" to purchase other two kinds of products. Otherwise, the variance of the number of "yes" among these three groups has a huge gap. The largest two amount of "yes" to buy GM products are 82 in"GM_NON_NO" group and 98 in "GM_NO_NON" group. These two number are highly larger than the number that person would like to buy GM products in other two groups. Then the WTPs on apples, strawberries and potatoes are calculated by the number of "yes" to buy them divided by the amount of total "yes" for one of the total 6 groups.

In total, the average WTPs on no-label, GM and non-GM products are 80%, 51% and 82% separately. The same as the results for the number of "yes", the average WTP on GM products is significantly lower than that on products with other two kind of labels.

The stigma effect become apparent when the average WTP of the products shown in distictive orders. The impact of the order presentation of presentation is shown in the table. The overall WTP on GM products is decreased when the GM products presented first to last. When the GM products presented first, the WTP value is 66% on average. However, when in the group 2 and 6, the GM products were presented in the last, the average WTP decreased to 41.5%, which is 37.1% lower than the average WTP between group 3 and 4 when the GM products were presented first. The reason is that consumers realized that they had the chance to buy non-GM products or products with no label. Additionally, the WTP when GM products shown in the second, which is in group 1 and 5, the average WTP, 44%, is also between the average WTP in other two situationa that GM was presented in the first or last. In fact, the variance of WTP on GM is apparently higher than that of other two variances, which indicates the fluctuation on the WTP on GM is significant. The stigma effect is apparent due to the difference between average willingness to pay.

In addition, the order of presetation of these variables matters WTP for GM products. Fisrt of all, we can read from chart 1 that the gap between consumers' willing to pay for no labeled, GM and non-GM products presented first or last is only obvious when GM products' order of presentation changes. It illuminates that consumers' WTP for GM products is much higher when GM products presented first.
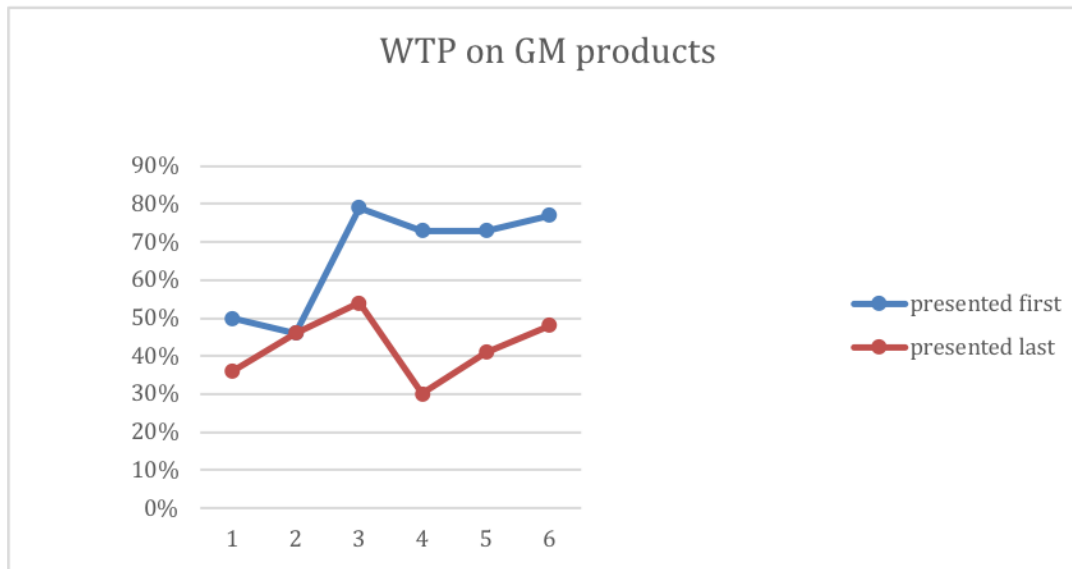
Graph 1(1) Percentage of WTP for GM products in different orders
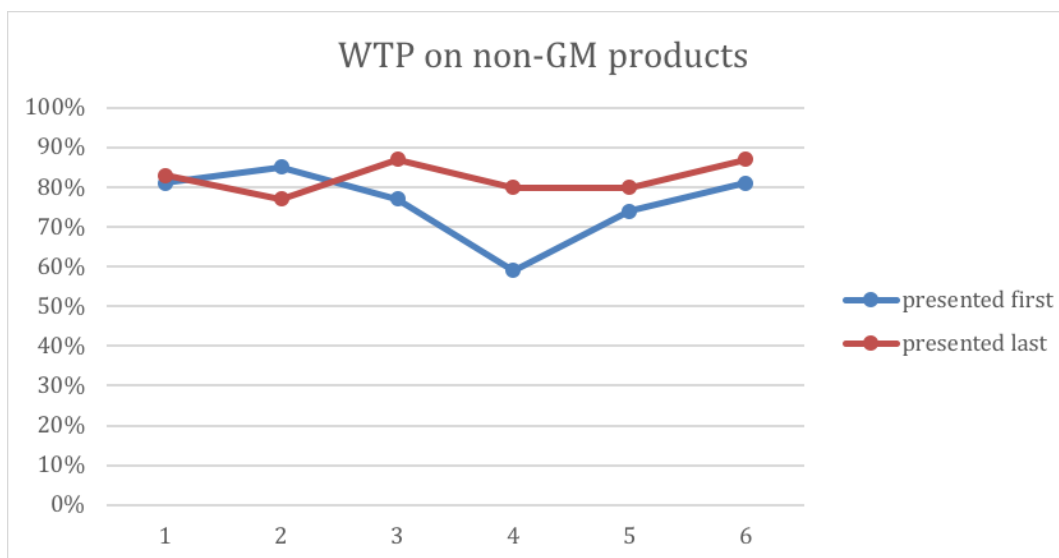
Graph 1(2) Percentage of WTP for non-GM products in different orders

WTP on no-labeled products
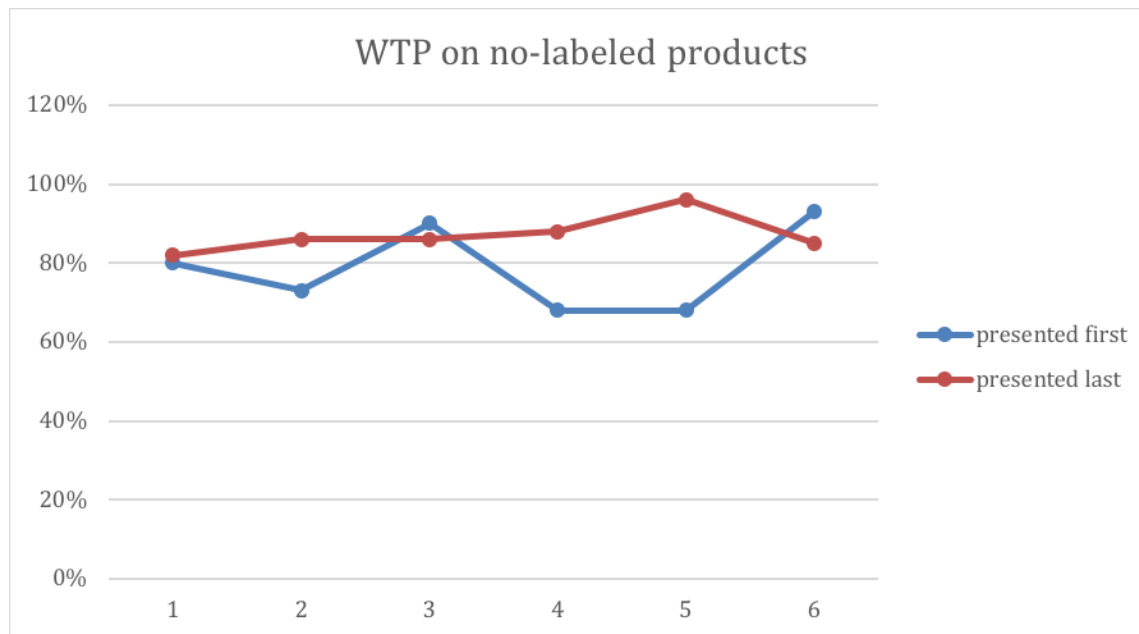
Graph 1(3) Percentage of WTP for no-labeled products in different orders

The result of regression also describes that consumers' WTP for GM products will be affected by

the order of presentation. Coefficients of four dummy variables are all below 0, which means

that consumers' WTP for GM products would be lower when other purchasing options existing.

Table 2. Two-Limit, Random -Effect Tobit Model of WTP for GM products

Variable	(1)NOGM		(2)NONG		(2)NONG		(4)NGNO	
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
CONSTANT	0.524	0.045	0.52	0.041	0.52	0.039	0.53	0.007
NOGM	-0.094	0.111						
NONG			-0.07	0.101				
NGGM					-0.07	0.097		
NGNO							-0.13	0.016

CHAPTER 5

CONCLUSION

It is not clear whether labeling would stigmatize consumers' WTP academically. While it has been proved that GMO products will not do harm on human by FDA, many people prefer to buy non-GM products because of stereotype. Adversely, many labeling, such as rBST-free milk and bird-friendly coffee, may increase consumers' WTP. It is tricky but works in the daily life.

To analyze this kind of stigma effect, Genetically modified products are good examples. In this paper, the objection is to research whether people would like to pay less for GM products and prefer non-GM products or products with no label. It is reasonable to study whether the occurrence of non-GM and products with no label will be harmful on GM products.

A study was conducted among 169 adult students and stuffs at Cornell University. The result of the experiment is significant in statistical level. It shows that the presentation of non-GM and no-labeled products stigmatized GM products. Differences among WTP on GM, non-GM and no-labeled products are used to evaluate the stigma effect. These results indicated that the occurrence of no labeled or non-GM products would decrease consumers' WTP for GM products.

Three varieties of agricultural products were used in the experiments, and the stigma effect on GM products is all significant among these three agricultural products. It represented that the trend that the demand of GM products decreasing will continue.

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