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Estimating Willingness to Pay for Continued Use of Plastic Grocery Bags and Willingness to Accept for Switching Completely to Reusable Bags

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ESTIMATING WILLINGNESS TO PAY FOR CONTINUED USE OF PLASTIC GROCERY BAGS AND WILLINGNESS TO ACCEPT FOR SWITCHING COMPLETELY TO REUSABLE BAGS

By

Jarod Dunn

A thesis submitted in partial fulfillment
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in

Applied Economics

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ABSTRACT

Estimating Willingness to Pay for Continued Use of Plastic Grocery Bags and Willingness to Accept for Switching Completely to Reusable Bags

by

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Utah State University, 2012

Major Professor: Dr. Arthur Caplan
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In this thesis we provide a theoretical framework for a dichotomous-choice contingent valuation survey for plastic and reusable shopping bags and consequential analysis of that data. By using interval regression analysis, a mean willingness to pay for continued use of plastic grocery bags and a mean willingness to accept to use reusable bags for all grocery shopping trips are estimated. The subsidy level was statistically robust while the tax level was not; this led us to the conclusion as cited from previous studies that people are very elastic to a plastic bag tax, and consequently a small tax provides tremendous consumptive declines.

PUBLIC ABSTRACT
Estimating Willingness to Pay for Continued Use of Plastic Grocery Bags and Willingness to Accept for Switching Completely to Reusable Bags

Jarod Dunn

This thesis demonstrates a surveying method to collect data to obtain tax levels for plastic grocery bag usage. This data was collected through asking respondents about a hypothetical situation in which they were required to pay a tax for using plastic bags or whether they would instead switch to using reusable bags that could be purchased at the grocery store. The respondents were also asked if they already were using reusable bags, how much would the store have to pay them for them to use reusable bags for all grocery shopping trips. From our analysis, people who use reusable bags for some trips would switch to using reusable bags for all trips if they were paid $0.12 per reusable bag that they brought from home. The tax level is hypothesized to be much less; as our findings indicate a small tax can decrease usage of plastic bags considerably.

ACKNOWLEDGMENTS

I would very much like to dedicate this thesis to my mother, Donna Lowmiller, whose environmental attitude had a great influence on me in my adolescence that carried over into my adulthood. She was a recycler when recycling wasn't cool. I vastly appreciate the patience of my girlfriend and best friend, Claire Magoc, with whom this would have never been finished in the time frame that I so desperately needed.

Of course my committee, especially Arthur Caplan and his tough love guidance throughout my academic career at USU, has made a lasting impression on me not only professionally but on a humanistic level as well. Arthur's advice of "keeping my ass in the chair!" really paid off.

Jarod James Dunn

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CHAPTER 1

INTRODUCTION

Communities worldwide have recently recognized the efficacy of using market incentives to promote the use of reusable bags as a substitute to plastic bags for grocery shopping. For instance, in 2002 Ireland introduced a 15 Euro cent tax on plastic shopping bags, previously provided free of charge to customers at points of sale. The effect of the tax on the use of plastic bags in retail outlets has been dramatic—a reduction in plastic grocery shopping bag use on the order of 90% [7]. In the U.S., Washington D.C. introduced a $0.05 tax on plastic bags in 2009, and plastic bag use dropped from an average of 22.5 million units a month to 3 million bags per month [13]. The goals of these types of programs have been to decrease plastic bags in landfills, eliminate street clutter, protect aqua-environments, or to prevent flooding in urban areas and thus mitigate risks to human health through the spread of water-borne disease [19]. The environmental externality of solid waste associated with plastic bag consumption illustrates the classic tragedy of the commons. Individual consumers benefit from the use of plastic bags because of its convenience, while society bears the collective cost of its disposal [21].

This paper provides empirical examples of how policy information can be generated for legislative bodies concerning the level of taxation that would cause 1) current users of plastic bags to switch to full use of reusable bags for grocery shopping, and 2) consumers who already partially use reusable bags (i.e. use them for some, but not all shopping trips) to use reusable bags for all grocery shopping trips. In specific, this thesis describes a survey instrument and concomitant estimation procedure that will enable estimation of the average consumer's willingness to pay (WTP) for continuing to

use plastic, rather than reusable bags; as well as a mean willingness to accept (WTA) for consumers who already use reusable bags for some shopping trips, to switch to using reusable bags for all shopping trips.

Both WTP and WTA are calculated using the contingent valuation (CV) survey method. A contingent market for plastic bags is created through providing the survey participant with pertinent information to make a "pay" (or "accept") decision. The survey method is discussed in detail in section 5.1. A primary goal of the contingent market is to provide enough pertinent information so that survey participants are encouraged to make more valid WTP statements [5]. We use a standard dichotomous choice contingent valuation or stated preference method for estimating both the mean household WTP and the WTA values. The estimates are obtained by fitting the data to an interval regression model [27] using STATA version 11.0.

Section two of this thesis begins with a literature review of current global policies and economic theory concerning plastic bag taxes and bans. Section three provides history and production statistics for plastic shopping bags and an illustration of the life cycle of a plastic grocery bag. Section four provides a summary of current plastic bag legislation for the U.S. Section five discusses the alternatives to plastic bags use and bag taxation. Section six of the thesis explores the empirical structure of our model and the surveying technique employed in our analysis. Section seven summarizes and analyzes the results of our empirical study. Section eight concludes by applying our findings to relevant upcoming and pending policy decisions concerning plastic grocery bags and provides some questions concerning future areas of research for this topic.

CHAPTER 2

REVIEW OF LITERATURE

Economic instruments are used to control pollution by harnessing the power of market incentives, thereby offering a more cost-effective, flexible, and dynamic form of regulation than offered by conventional measures [3]. Economists have long advocated the use of economic instruments as an alternative, or supplement, to direct regulation because of their ability to achieve the same or greater level of environmental protection for a lower overall cost [3]. Given the importance of the overall costs of environmental protection in political debate, this is a crucial advantage for market instruments [3]. Over time there have been numerous types of instruments proposed to correct a wide assortment of market failures. For instance, cap-and-trade policies have been implemented in Europe in an effort to adhere to the carbon dioxide standards set in the Kyoto Protocol [3]. Initiated with changes to the Clean Air Act of 1990, the US used a similar cap-and-trade policy to reduce acid rain and improve the public health [9].

A tax on plastic bags can lead to a desired environmental improvement, that is, reduction in waste generation and littering. This argument is asserted in an analysis of plastic bag legislation in Botswana [14]. In order to determine what tax rate is necessary to obtain a given reduction goal, policymakers must be provided with a response measure, such as the elasticity of demand for plastic bags, which measures the percentage reduction in plastic bag demand in response to a 1% increase in the price (e.g. through the implementation of a per-bag tax). How effective a plastic bag tax is depends upon the actual amount charged for each bag [14].

Previous studies have found that consumers will respond to such taxes, as

mentioned in the 2002 Ireland study, with an additional gain in the form of reduced littering and positive landscape effects [7]. The study's authors concluded that taxes on products, in addition to influencing consumer behavior, can also provide efficiency and environmental payoffs, and do so at negligible cost to consumers [7]. A consumer-based ''downstream'' tax therefore can be an appropriate policy measure.

As another example, in May 2003 South Africa introduced legislation intended to decrease plastic bag litter. Policymakers combined standards and price-based economic tools in an attempt to reduce the public's demand for plastic bags. A 1996 survey of consumer attitudes in South Africa towards plastic bags [12] found that 82% of respondents were favorable toward an environmental tax on plastic bags. If faced with such a tax, 56% said that they would bring their own shopping bags on shopping trips [12].

Initially in South Africa under the tax agreement, firms charged consumers 0.46 Rand (about 6 U.S cents) per-24 liter plastic bag. Environmentally and from the state's perspective, the regulation was a resounding success with ''reduced litter'' and ''less devastation to marine life.'' During the first few months of the tax, plastic bag manufacturers experienced a ''dramatic'' 80% reduction in sales. In August of 2003 the tax was lowered 0.17 Rand (about 2 U.S. cents) due to pressure from the plastic bag industry [12]. Subsequently, sales of plastic bags then enjoyed a 30% increase. The authors concluded that the combination of standards and pricing successfully curbed plastic bag use [12].

Taxes on economic goods can also lead to more consumer awareness of the environmental "bad" they are producing. Apart from the evidence from environmental

taxation, where a tax on plastic bags reduces their usage, the mere provision of information to consumers about the demerits of plastic bag usage can have a significant effect as well. Low cost information interventions can be very effective as they update the beliefs of agents regarding the "social costs" of plastic bags [21].

Businesses in the US have made changes as well in regards to plastic bag policies, including the pharmacy CVS and the retail giant Target [16]. Two grocers that banned plastic bags in their stores are Trader Joe's and Whole Foods Market [16]. Reusable bags are used as substitutes in these grocery stores. Target, the fifth largest retailer in the country, did a test run of 100 stores providing an incentive, a $0.05 discount for each reusable bag the customer uses, which decreased plastic bag use by approximately 50%. The Target program went company-wide and nation-wide on November 1, 2009 [16].

CHAPTER 3

A HISTORY OF PLASTIC BAGS

Plastic grocery bags have been a part of daily life in developed countries since their introduction in 1977 [25]. The ubiquity of plastic bag use has risen as their cost of production has continued to drop over the last three decades. The transition to using plastic bags (from paper bags) has diverged greatly over this time period; they are now the choice of 90% of shoppers [20]. Every year approximately 500 billion to 1 trillion plastic bags are consumed worldwide [4]. Traditional plastic grocery bags take 400 to 1000 years to break down in landfills [16].

Plastics are some of the most utilized materials (on a per-volume basis) in U.S. industrial and commercial life. Traditional polyethylene-based plastic bags are made from ethylene—a gas derived from natural gas— or a component of crude oil that is similar to a natural gas, both of which are products of non-renewable fossil fuels [20]. According to the U.S. International Trade Commission, plastic bag consumption for the United States in 2008 was 102.1 billion bags [24].

Two ingredients are essential in plastic bag production, natural gas and petroleum. Plastic bag production demand accounts for 4 % of the world's total petroleum supply [9], [13]. The process of manufacturing plastic grocery bags requires significant quantities of both energy and raw materials. Two plastic bags require 990 kJ (kilojoules) of natural gas, 240 kJ of petroleum, and 160 kJ of coal [13]. The life cycle of a plastic bag begins with the extraction of these raw materials (see figure 1).

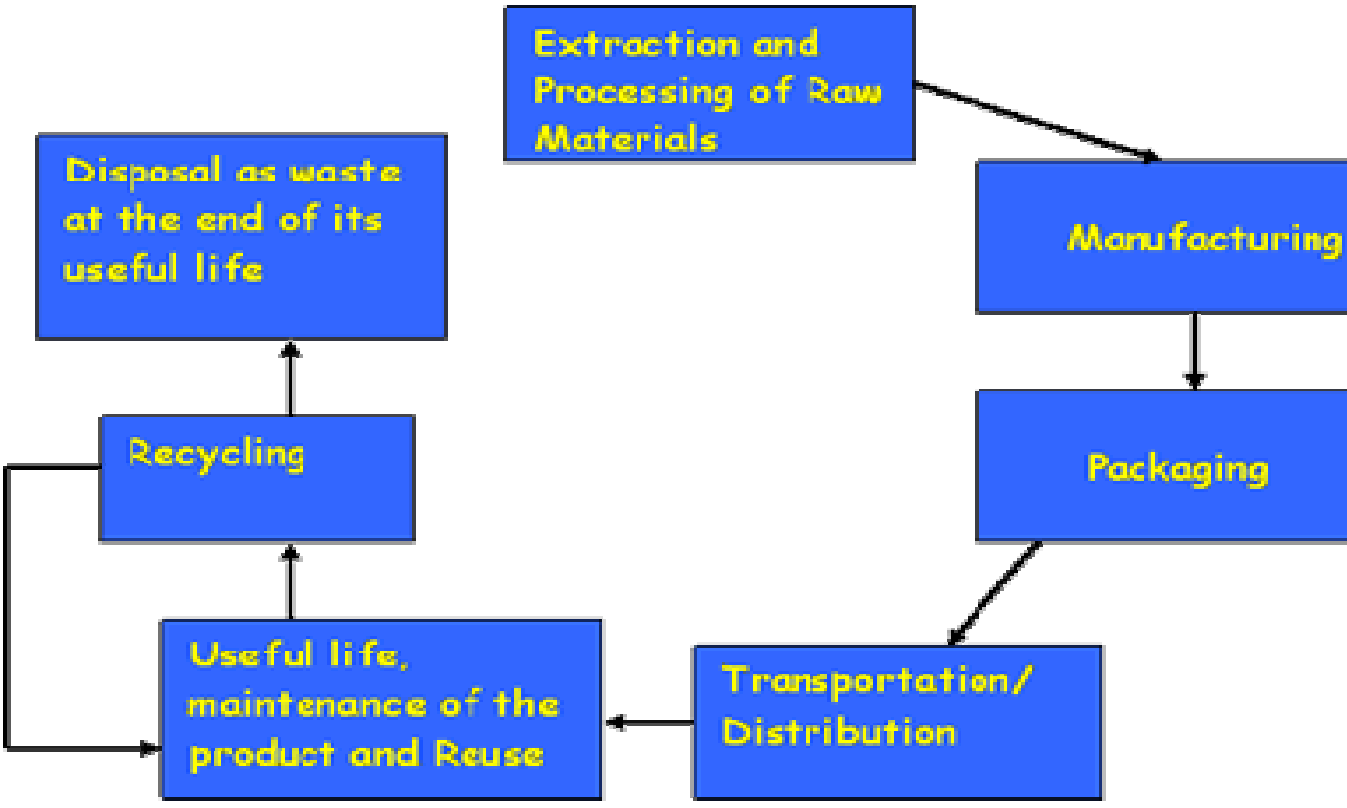


Fig. 1 Life Cycle of Plastic Bags

Residual plastic bags populate the landscape once they are discarded. Americans throw away approximately100 billion plastic bags per year. The creation of 100 billion plastic bags requires about 12 billion barrels of oil. Even as plastic bags breakdown, they release chemicals into the environment that are considered to be carcinogenic to humans [4].

Plastic litter has led to clogged drains resulting in sanitation and sewage problems, harmful digestion by animals, and indiscriminate pollution of the air and releases toxic substances. The Mumbai floods in India in which about a thousand people died were blamed in several quarters to drains being clogged from plastic bags [21]. Bangladesh banned plastic shopping bags owing to the same reason [21].

CHAPTER 4

CURRENT PLASTIC BAG LEGISLATION IN THE U.S.

Since the 1990s, governments in countries such as Australia, South Africa, Ireland, Canada, New Zealand or the Philippines have been imposing taxes on plastic bags and regulating their use [8]. The U.S. only recently has begun to address the problem of plastic bag use using various local governmental bans and varying levels of taxation as attempts to curb consumption. Some environmentalists have expressed concern that tax rates are likely to be set too low from an environmental perspective; they fear such rates would not provide an adequate incentive to reduce waste discharges to a socially optimal level [17]. This underscores the importance of this thesis' results.

The most successful and publicized tax scheme for plastic bags has been in Ireland, but there are various states in the U.S. that are in the midst of taking legislative action. States with plastic bag tax proposals include California, Texas, New York, Oregon, Washington, Idaho, and Minnesota. Washington D.C. is the only area in the U.S. that has actually enacted a tax at a rate of $0.05 per bag. According to a recent study, a per-bag tax policy is estimated to reduce net waste and total garbage volumes by 26.9–28.3% and 25.9–27.6%, respectively [27]. Utah does not have any proposed or enacted plastic bag legislation as of 2011.

In the fall of 2011 the state of Idaho and the city of Juneau, Alaska will vote on proposed $0.15 taxes on plastic bags. California has been the most aggressive state in proposing and passing plastic bag legislation, primarily through its municipalities. Santa Cruz (Bag Ordinance 5.48), Marin County (Bag Ordinance #3553), Santa Clara (Ordinance 517.77), and Santa Monica (Municipal Code Chapter 5.45) have all passed

legislation banning plastic bags.

CHAPTER 5

REUSABLE BAGS

The idea of “going green” has become increasingly widespread; industries, governments, communities and individuals are behaving in more sustainable ways [22]. One of the ways that individuals have embraced this sense of sustainability is through the use of reusable shopping bags. For our survey purposes we have defined reusable bags as “bags meant for multiple- use that are made of canvas, cloth, or some other washable fabric”. In 2008, Whole Foods Inc. eliminated the plastic bag as an option for customers and has since seen sales of reusable bags skyrocket by 300% [10]. Other grocers have promoted the use of reusable bags through giveaway promotions and “trendy” bag designs. Home Depot distributed 500,000 free reusable shopping bags last April on Earth Day, and Wal-Mart similarly gave away one million. One line of bags features tags that read, ‘‘Saving the World One Bag at a Time’’ [10].

Getting people to actually use the bags is another matter, which at least in some cases requires changing deeply ingrained behavior. At present, many of the bags go unused -- remaining stashed in consumers' closets or in the trunks of their cars. In 2008, KPIX in San Francisco polled 500 of its television viewers and found that more than half -- 58% -- said they almost never take their reusable cloth shopping bags to the grocery store [10].

CHAPTER 6

ALTERNATIVE POLICY OPTIONS

In attempt to solve the problems that plastic bags create, economists and legislators have suggested alternative vehicles aside from consumer taxation. These include a tax on retailers, tradable permits, or reusable bag subsidies. Public education campaigns have also been cited to increase public awareness, but even though educational strategies are publicly acceptable, an information campaign would be a poor (even unfeasible) public policy from a fiscal and cost-internalizing perspective [2].

In countries such as Denmark retailers are faced with “general waste” tax on plastic grocery bags. Since implementation the use of plastic bags has gone down by 66% [2]. Overall, a Pigouvian tax on plastic bags is much more effective if placed on the consumers because the goal of the tax is to effect consumer behavior, not cause retailers to incorporate the tax into their product pricing [2].

In a command and control scheme, tradable permits could be issued to grocers perhaps on state level. The optimal plastic bag target would have to be calculated and the cap would be set to ensure environmental protection. A market would be created for the permits and each grocer would face an incentive to curtail use of plastic grocery bags. With this in mind the application of tradable permits is probably not the best or most politically feasible approach to solving the plastic bag problem [2].

An ancillary computation in our analysis is the WTA for consumers using some reusable bags for grocery shopping to make the switch to using reusable bags for all grocery store transactions. This alternative to taxation suggests the amount of a subsidy to be assigned to reusable bags to eliminate plastic bag use. While a subsidy would be

more politically popular than a tax, a true subsidy would be too expensive to fund and the proposed store-funded rebate would be ineffective in addressing the environmental problems as a result of the indirect effects of its incentive structure [2].

Another option would be a hybrid policy of a combination of a tax on plastic shopping bags to subsidize consumers using reusable grocery bags. A Pigouvian tax on consumers is clearly the economic optimal policy to internalize the quantifiable external cost of these environmentally damaging bags [2]. And while this would indeed curb plastic bag consumption it could be reinforced with the combination of using that revenue to transfer to customers using reusable bags. This would be especially effective given the use ratio between plastic and reusable bags. According to local grocers, using one reusable bag saves about 4 to 5 plastic bags (personal correspondence 2011). If those 4 to 5 bags were taxed they could easily subsidize reusable bag users and also be used to fund the implementation costs associated with regulating their usage.

CHAPTER 7

METHODOLOGY

Two methodologies are used in this study. The first is concerned with the design of a dichotomous-choice, contingent valuation (CV) survey, which is subsequently used to obtain the necessary data for our empirical analysis. Dichotomous questions are frequently used to estimate the value of nonmarket goods [15]. The second methodology concerns the application of an econometric model to compute mean WTP and mean WTA estimates.

Survey Methodology

The online survey begins with an introduction informing the respondent about current estimates of plastic bag consumption in Logan, Utah, and discusses the possibility of switching from plastic to reusable shopping bags. The term "reusable bags" is also clearly defined. Two links are provided http://plasticvpaper.weebly.com/reusable- --pros--cons.html and http://abcnews.go.com/Politics/washington-dc-charge-disposable-bag-fee/story?id=9456761, which, if followed by the respondent, provide information about: 1) Washington DC's experience with a plastic bag tax, and 2) a list of pros and cons for using reusable shopping bags versus plastic bags provided by local grocers. A respondent's decision of whether or not to follow one or both of the links is voluntary.

Once a respondent moves to the second page of the survey, a routing question is asked, "Before participating in this survey, had you ever heard of using reusable bags for grocery shopping?" Contingent upon the respondent's answer to this question, the respondent is routed in one of two directions: 1) those who have previously heard of using reusable bags, and 2) those that have not.

Survey participants who do not have prior knowledge of reusable bags are asked a series of questions to prime them for the WTP dichotomous choice-question. Before this question is asked a "cheap talk" reminder statement [1] is used to infuse the hypothetical WTP question with some sense of realism. In essence, the respondent is reminded that reusable bags have a one-time cost, and would have to be carried with them to the grocery store on their shopping trips.

The four randomized bid values selected for the WTP question are: $0.05, $0.10, $0.25, and $0.35. These are the hypothetical per-bag tax rates levied on the plastic bags used in our survey. The bid values were chosen from a deviation of ± $0.15 from the calculated social cost of plastic bags depicted in Table 6a below. This table was constructed using a scientific article on the environmental damage of plastic bags and waste management data from cities across the country. From this data the external cost of production, transportation, and consumption externalities are empirically quantified [2].

The respondent has the choice of answering yes, no, or unsure to the question of whether they would switch to using reusable bags in response to facing the randomized tax rate. The same methodology is used to gather data necessary to compute a mean WTA for respondents already using reusable bags some of the time. A "certainty follow-up question" [6] is then asked in order to provide some indication of the certainty with which the respondent has answered the WTP/WTA question. The question offers a range from 0 to 100 % on how certain the respondent is of the answer they have provided to the WTP/WTA question.

Table 1

Environmental Externalities of Plastic and Paper Bags*	
Stage in Bag's Life Cycle	**External Cost Borne by Society (¢ / bag)**
Production	
CO2 Emissions:	0.20¢ / bag
Transportation	
CO2 Emissions:	unknown
Disposal	
Litter:	5.20¢ / bag
Landfill:	2.92¢ / bag
Improper Recycling:	2.20¢ / bag
Total Social Cost per Bag:	10.52¢ / bag

*Source: [2]

If instead the respondent initially indicates prior knowledge of reusable bags for grocery shopping purposes, they are routed to a separate set of questions. These questions narrow in on the respondent's knowledge and use of reusable bags. These

questions in turn route the respondents into two groups: 1) those that use reusable bags for every shopping trip, and 2) those that use reusable bags either more than half the time or less than half of the time. Respondents that are unsure are routed to the WTP question for continued use of plastic bags.

Those routed to group 2 are asked a dichotomous-choice WTA question, which is also prefaced with "cheap talk" in order to elicit an accurate response. The randomized bid value for this question is drawn from the interval ($0.05, $0.10, $0.25, $0.35). The question asks if the subsidy value is enough to induce the respondent to use reusable bags for all grocery trips. The follow-up certainty question is also asked of these respondents.

Respondents that use reusable bags on all shopping trips (group 1) are routed to a simple qualitative question that asks about whether they receive any sort of compensation for using reusable bags at their grocery store. They are then routed to a set of demographic questions, questions that all respondents are asked to answer in the final section of the online survey.

Before the survey was administered to the public it went through three rounds of pre-testing. Pre-testing, in the form of having various focus groups participate in and evaluate the survey instrument, was used to mitigate any confusion associated with the question format. The groups included environmental consultants, professors of economics, including varying sexes and levels of education. Focus groups consisted of between three and five individuals. The groups included participants who had no prior knowledge of reusable bags for grocery shopping, as well as participants who currently use reusable bags for some or all of their grocery shopping trips.

As part of the pre-testing, participants in the groups were asked two sets of questions. The first set of questions dealt with what they valued about using plastic bags. Comments ranged from seeing the bags as valueless to using the bags in a variety of ways, such as trash bin liners, packed lunch containers, and a convenient way to take home their groceries. A second set of questions addressed barriers to using reusable bags. These questions targeted individuals who were ex ante aware of the possibility of using reusable bags for grocery shopping. The most common barrier for these individuals was forgetfulness associated with their use. Leaving the bags at home or in the car was seen as a common obstacle.

Several factors concerning the survey were clarified as a result of engaging these focus groups. For one, the benefits obtained through the use of plastic bags are now better articulated in the survey questions. Also, common barriers associated with nonuse of reusable bags are better articulated in the contingent scenario, in order to make the questions more consistent with real life. The contingent scenario itself also been streamlined in favor of a more concise, understandable presentation. One criticism of using the CV method to estimate nonmarket values is that respondents do not have enough experience with the commodity being valued [18]. Respondents do however have experience with using plastic grocery bags.

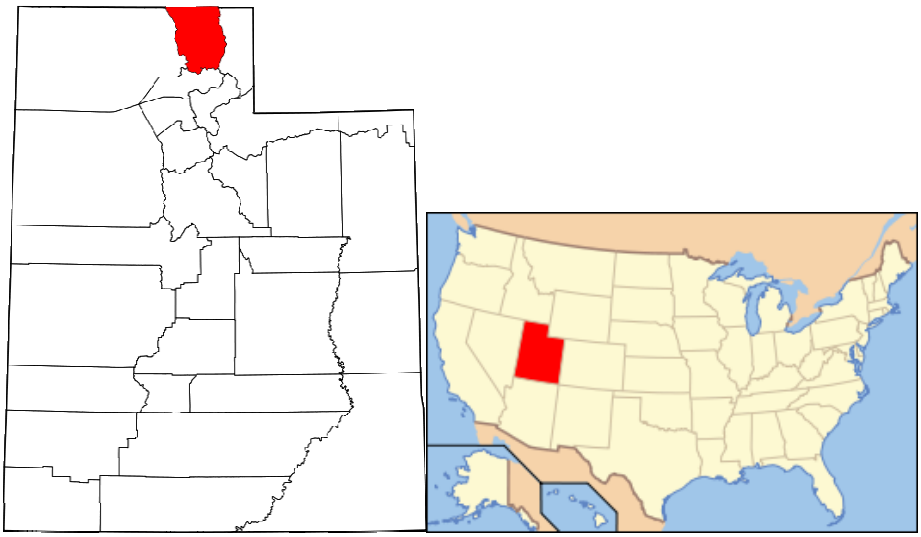
The survey was published using the online survey application, Survey Gizmo. To recruit participants, a postcard has been created (see Appendix A) that includes instructions on how to login to the online survey at surveygizmo.com. Participants will be solicited in three ways. First, the postcards were delivered to random areas around the

city of Logan, Utah.[1] All postcards were delivered within the 84321 and 84322 zip code areas.

Survey participants were also solicited in front of two local grocery stores, Lee's Marketplace and Fresh Market. Third, postcards will be delivered in a door-to-door approach. The residences were asked if they would be willing to take 10-15 minutes to fill out an online survey about plastic bag use in Logan, Utah. Again, geospatial considerations were made to try and extract a random sample of the general population of Logan.

As described above, the survey was administered in a variety of ways in an effort to obtain a representative sample of the Logan population. Twelve hundred postcards were produced, each providing the web address for the survey. Each postcard was also coded with a unique alphanumeric code for the respondents to type in at the end of the survey. Respondents were instructed to go to a website that will be created for this study on a certain date. A code number chosen at random was then published on the site, with

[1] Logan city is located in the northeast corner of Utah in Cache County highlighted in red below. In 2009Logan had a population of 46,000 people including 16,000 households [27].



instructions on how to claim the prize (a $100 gift card to a local merchant) for the lucky winner.

Empirical Methodology and Theoretical Framework

The theory behind the WTP for continued use of plastic bags and the WTA for sole use of reusable bags are depicted in figures 2 and 3, respectively.

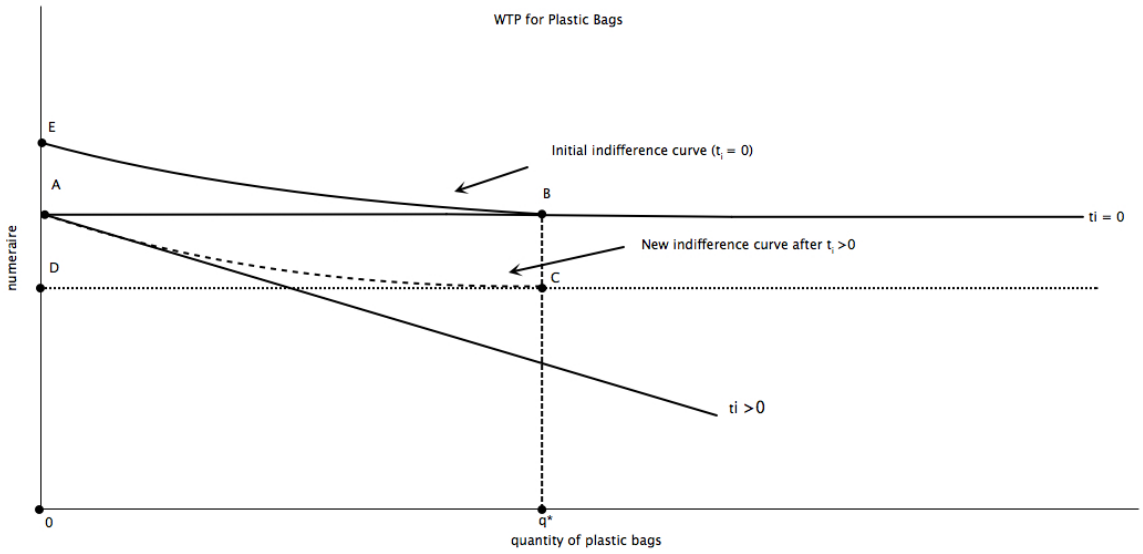


Fig. 2 Willingness to Pay for Plastic Bags

In figure 2 the y-axis is income or composite commodity (numeraire) and the x-axis represents the quantity of plastic shopping bags used; with q* representing the initial consumption level of plastic bags. The initial steepness of the indifference curve indicates that the consumer places a relatively low value on plastic bags (relative to the numeraire). Point B represents the satiation point for plastic bags demanded when they are free. The initial budget constraint ($t_i = 0$) shows no loss income associated with more plastic grocery bag use. With the introduction of a tax, a downward shift of the

indifference curve occurs moving the new quantity to 0, where point A is tangent to the indifference curve on the graph. The new budget constraint ($t_i > 0$) shows the negative relationship between the use of plastic grocery bags and income. Equivalent variation is then measured as the distance between points A and D, showing the maximum willingness to pay for continuing to use the satiation-level of plastic bags.

Figure 3 depicts the consumer's reaction to a reusable bag subsidy, when the consumer initially uses reusable bags for some, but not all, grocery trips. For sake of example, the initial budget constraint shows the initial use of about 1.7 reusable bags per grocery trip to the store. When a subsidy is introduced (S_i') the original budget constraint is rotated counter-clockwise and becomes positive sloping. This would result from a large enough S_i', resulting in a negative net reusable-bag price (net of the inconvenience cost associated with having to remember to bring reusable bags on a given grocery trip) for the consumer. As a result, the new utility maximizing level of reusable bags rises to three reusable bags per grocery shopping trip. The gap between points A and F represents the equivalent variation or the minimum WTA for using reusable grocery bags for each grocery trip.

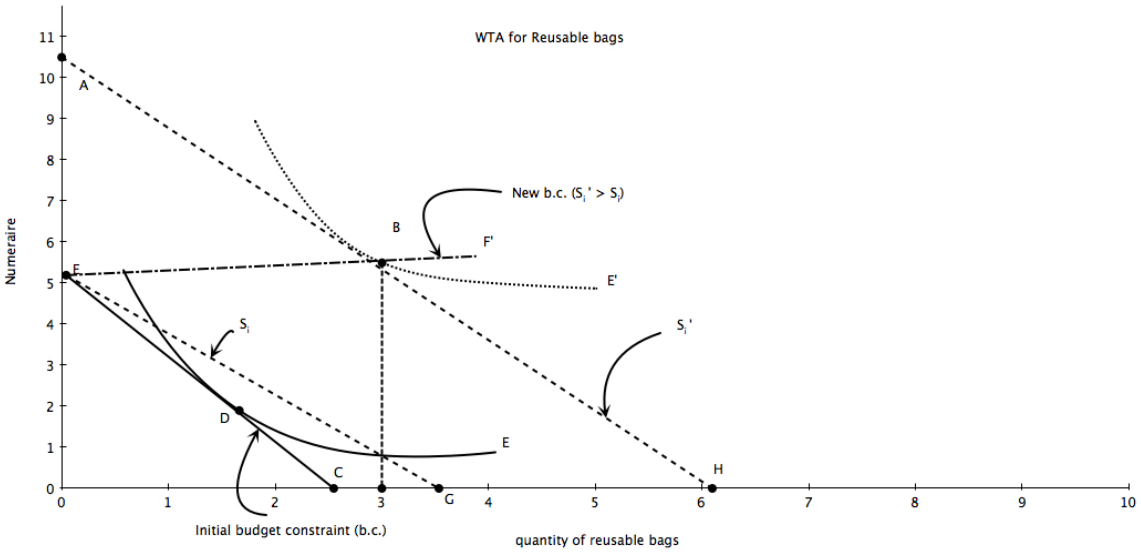


Fig. 3 Willingness to Accept for Reusable Bags

Regression Analysis

Interval regression analysis was used to calculate a mean WTP for continuing to use plastic bags and a mean WTA for respondents who have knowledge of reusable bags but do not use them for all grocery store transactions. Again, the following two question formats will be used to obtain the data:

1) *Willingness to Pay (WTP)*:

"If your grocer begins charging you $\$t_i$ per plastic bag at the checkout, would you switch to using reusable bags brought with you from home?"

$t_i \in \{0.05, 0.10, 0.15, 0.35\}$

2) *Willingness to Accept (WTA)*:

"If your grocer provided a subsidy of $\$t_i$ per reusable bag that you would bring from your home would your household switch to using reusable bags for all grocery shopping trips?"

$t_i \in \{0.05, 0.10, 0.15, 0.35\}$

Based on his response to the bid values, a respondent's latent WTP may be placed in one of two regions: $(-\infty,t_i)$ in the event of answering "no" to the WTP/WTA question and (t_i,∞) in the event of answering "yes" [1].

WTP and WTA (henceforth denoted interchangeably as WTP/A) are both calculated using the following general equation:

(1) $WTP/A_i = X_i\beta_i + \varepsilon_i$

where X_i is a vector of explanatory variables, including demographic characteristics and corresponding bid values, and β_i is a vector of corresponding coefficients. An i.i.d error term ε_i is included to account for unexplained variation in respondents' estimated WTP/A. For estimation purposes, a binary choice variable, $ACCEPT_i$, is defined, which equals one if the respondent accepts t_i and equals zero if not. Thus, $ACCEPT_i = 1$ responses imply $WTP/A_i > t_i$ and $ACCEPT_i = 0$ responses imply $WTP/A_i \leq t_i$ [1].

Using equation (1), the probability that household *i* accepts bid t_i is:

(2) $P_i = Pr[ACCEPT_i = 1]$

$= Pr[WTP/WTA_i > t_i]$

$= Pr[\varepsilon_i > t_i - X_i\beta]$

$= Ö\ (X_1\beta - t_i)$

where Ö is the standard normal density function and the last equality follows from Ö's symmetry. The associated log likelihood function is

(3) $\text{Log L} = \sum_{i=1}^{N} \{ACCEPT_i \ln(P_i) + (1 - ACCEPT_i)\ln(1 - P_i)\}$

where Log L is estimated as an interval regression model [1], [26].

CHAPTER 8

VALIDITY OF THE SAMPLE

Responses

Table 2 summarizes the denial rates for postcards that were handed out at the two grocery locations in Logan, UT; specifically, Fresh Market Foods and Smith's Marketplace. Out of the total of 700 postcards distributed, approximately 3.8% of shoppers refused to accept the postcards. With over 95 % of people solicited taking the card, an overwhelming majority had the possibility of participating in our study. A combined total of 1400 postcards were handed out at the aforementioned grocery stores and distributed via mailbox drops; 216 replies were received for an overall response rate of 15.4 %.

Table 2. Postcard Refusal Rates at Supermarkets

Postcards Distributed	Location	Number of Refusals	Refusal Rate
350	Fresh Market	12	3.4
350	Smith's Marketplace	15	4.2
Total			
700		**27**	**3.8**

Demographic Comparisons

Descriptive statistics are presented in Appendix B. The average household size for respondents for our WTP and WTA analyses were 3.08 and 3.16 persons respectively. In 2010 the average family size in Logan, Utah was 3.24 [23]. The number of white respondents in our analysis was 90.8 % for WTP and 86.3 % for WTA. 2010 census data found that 83.9 % of Logan residents identified themselves as being of white race [23]. The percentage of male respondents to our WTP surveys was 28%, while our WTA was 29%. The population of Logan is nearly is 49% male, however a recent survey shows that women do approximately 64% of the shopping [11]. With pertinence to education level, 93% of our total respondents were high school graduates, compared to actual census data of 90.9% [23]. On average 81% of our respondents made between $25,000 and $75,000 per year. Between years 2005 and 2009 the median income for Logan was $34,466 [23].

CHAPTER 9

ECONOMETRIC RESULTS

Willingness to Pay

Econometric results for the dependent variable *pbtaxa* run against the nine independent variables included in our household sample (N = 59) are shown in Table 3 below. The variable *pbtaxa* is a binary decision variable representing the choice made when facing our hypothetical tax decision; a "1" signifies yes, while a "0" equates to a no response. The overall estimate of mean WTP for continued use of plastic bags is calculated as $0.33 per plastic bag used with an achieved significance level (ASL) at the 90% confidence level. Our independent variable *taxbid* is not statistically significant at conventional levels leading to two potential hypotheses concerning the effect of this variable.

Table 3. Probit Model Mean WTP and WTA

Dependent Variables *rbsuba/ pbtaxa*

VARIABLES*	WTP MODEL	WTA MODEL
subbid/taxbid	-0.0499984	.6291223*
	(0.151)	(0.06)
rbfree	-0.3705264**	0.2332379***
	(0.021)	(0.009)
pbrecy	-0.0008408	.0473067
	(0.921)	(0.446)
rblandf		.3681581*
		(0.064)
young	-0.0055779	-.1492719
	(0.621)	(0.148)

middle	0.4133204**	-.1894256
	(0.016)	(0.104)
sex	0.0047851	-.1760966**
	(0.595)	(0.020)
totnhh	-0.0125541**	.0183592
	(0.012)	(0.290)
lowinc	-0.240514***	.1795108**
	(0.010)	(0.022)
midinc	-0.0180216**	.1029472*
	(0.033)	(0.057)
N =	59	90
R squared	0.5277	.3384
	Mean WTA	**Mean WTP**
	$0.12*	**$0.32***
ASL	**(.0891)**	**(.0876)**
***Significant at the 99% confidence level		
**Significant at the 95% confidence level		
*Significant at the 90% confidence level		

Both of these hypotheses rely on the fact that a preponderance of zeros were found as responses to the hypothetical bid question for continued use of plastic bags at any given taxation level. The first hypothesis is simply a lack of variability in the data, which nevertheless reflects reality in the population at large. The second hypothesis is that a strongly elastic relationship between usage and a tax in fact exists, suggesting that plastic grocery bags for shopping are considered to be a (very strong) luxury good. This

second hypothesis is consistent with a previous study where 92% of respondents were not willing to pay over $0.05 to retain usage of plastic bags [7], which in turn suggests that a small tax (under $0.05) can have a significant impact on plastic bag consumption. Respondents that rejected the tax bid are summarized in the following table.

Table 4. Tax Bid Responses for *pbtaxa*

Bid Value	Number of Respondents Asked	Number of Accepted Bids	% *pbtaxa* = 0
$0.05	19	5	73.7
$0.10	15	1	94.3
$0.20	13	1	93.4
$0.35	15	2	87.7
Total	**62**	**9**	**87.28%**

Although the variable *taxbid* is not statistically significant, the negative sign for the coefficient is expected, i.e. the higher the tax level, the less likely the consumer is willing to accept it. Another expected estimation is the variable *lowinc*, which is significant at the 99 % confidence level. The negative sign on this coefficient suggests that low-income persons are less likely to willingly pay the plastic bag tax, ceteris paribus, than those with high incomes. The variable *midinc* is also significant at the 95 % confidence level, and has a negative sign.

Three other independent variables are significant at the 95 % confidence level: *rbfree*, *middle*, and *totnhh*. The variable *rbfree*'s negative sign suggests that people who would switch to using reusable bags if they were free would be less likely to pay the tax. The variable *middle*'s positive sign suggests that all else equal, people who are middle-aged are more likely to pay the plastic bag tax than those in old age. The middle-aged

working class generally should possess more income and are perhaps busier than the older population, so they could be more willing to pay a tax than be inconvenienced by having to use reusable bags. The independent variable *totnhh* also has a negative sign, suggesting that as household size increases, the less likely the household is willing to pay the tax. This could be because larger sized households could use considerably more plastic bags; therefore a tax on consumption would create a larger expense than it would for a smaller household.

Willingness to Accept

Econometric results for the dependent variable *rbsuba* run against the nine independent variables included in our household sample (N = 102) are also shown in Table 3. The dependent variable *rbsuba* represented a binary decision variable whether the respondent accepted or rejected the randomized subsidy value. Again, a response of "1" signified an accept response, while a "0" reflects a reject response. The mean WTA for switching to using reusable bags for all grocery trips was calculated as $0.12 per reusable bag with an ASL of 90% confidence level, this is shown in Table 3. Therefore theoretically, if a subsidy of at least $0.12 per reusable bag were offered to the average household that currently uses some reusable bags for shopping, this household would switch to using reusable bags for all grocery shopping trips.

In our probit model for WTA our *subbid* variable was positive and significant at the 90% confidence level. This was as expected. The positive sign suggests that increasing the subsidy indeed provides additional incentive for households to switch from using reusable bags some of the time, to using reusable bags for all grocery trips. The variable *rbfree* is statistically significant at the 99% level. This makes intuitive sense one

would expect that, all else equal, people are willing to switch to using reusable bags full time when they are available for free.

Both *lowinc* and *midinc* are statistically significant at the 95 and 90 % level respectively, suggesting that a subsidy would induce both lower- and middle-income individuals to use reusable bags full time (relative to high income individuals). The gender of the respondents is also significant at the 95 % level, with the negative sign suggesting that women are more likely than men to switch to using reusable bags full time.

CHAPTER 10

CONCLUSION

Our data gathered through a contingent valuation survey and subsequently estimated via regression analysis can be useful in guiding current public policies regarding grocery bag use. It has been shown through our empirical analysis, and verified by previous findings in Europe, that tax rates on plastic bags are strongly elastic. Even a small tax will yield considerable results when the desired result is a reduction in the use of plastic grocery bags.

With regard to taxation, the elastic nature of a plastic bag tax is important in regards to what the traditional Pigouvian tax might be, where the marginal social cost of the bags would determine the tax rate. This marginal social cost has been estimated to be approximately $0.10 per bag [2]. Our results, and the results of Convery et al, suggest that the tax could be set much lower than this and achieve the desired reduction in consumption.

This is the first empirical analysis we are aware of that calculates a WTA for full use of reusable grocery bags. As mentioned above, reusable bag subsidies have already been implemented in grocery stores across the United States. However, there are no previous studies that suggest subsidies as high as our WTA estimate of $0.12 per bag. Among grocery stores surveyed in Logan, UT the average subsidy rate was $.05 per reusable bag.

Attempts were made to eliminate bias from our analysis, in specific pre-testing was done to minimize hypothetical and starting-point biases. However, there were areas where our study fell short. The informational websites provided in our introduction to mitigate information bias could have been replaced with information sheets, so that

everyone would have a better chance of being equally informed. These websites contained information on the $0.05 per bag tax in Washington D.C. which could have introduced an anchoring bias in the WTP responses of those who viewed the websites. However, due to the consistency of our findings and the external validity of the Convery et al. study [7], bias in our results seems to be minimized.

There are obvious directions for future research. The budgetary constraints of this study limited the analysis to Logan, UT. A comparison study with a different population would help generalize our results. Policies governing plastic bag use will benefit from additional empirical study in order to further our understanding of the relationship between consumer preferences and the demand for plastic grocery bags.

REFERENCES

[1] D. Aadland, A. Caplan, Curbside recycling: waste resource or waste of resources? Journal of Policy Analysis and Management 25(4) (2006) 855-874.

[2] A. Akullian, C. Karp, K. Austin, D. Durbin, Plastic bag externalities and policy in Rhode Island. Brown Policy Review (Fall 2006).

[3] D. Austin, Economic instruments for pollution control and prevention – A brief overview. World Resources Institute (September, 1999).

[4] A. Baker, Fees on plastic bags: altering consumer behavior through taxing environmentally damaging choices. (2010) ExpressO Available at: http://works.bepress.com/alice_baker/1. Accessed September 2011.

[5] G.C. Blomquist, J.C Whitehead, Resource quality information and validity of willingness to pay in contingent valuation. Resource and Energy Economics 20 (2006) 179–196.

[6] A. Caplan, D. Jackson-Smith, S. Marquart-Pyatt, Does 'free sampling' enhance the value of public goods? Applied Economic Letters 17 (4) (2010) 335-339.

[7] F. Convery, S. McDonnell, S. Ferreira, The most popular tax in Europe: lessons from the Irish plastic bags levy, Environ Resource Econ 38 (2007) 1–11.

[8] H. Cherrier , Consumer identity and moral obligations in non-plastic bag consumption: a dialectical perspective, International Journal of Consumer Studies 30 (5) (September 2006) 515–523.

[9] Environmental Protection Agency (EPA). Reducing acid rain. Available at http://www.epa.gov/air/caa/peg/acidrain.html. Accessed December 26, 2011.

[10] E. Gamerman, An inconvenient bag. Wall Street Journal Online edition 2008. Available at: http://online.wsj.com/article/SB122238422541876879.html. Accessed

October 17, 2011.

[11] J. Goodman, Who does the grocery shopping, and when do they do it? The Time Use Institute. Available at http://timeuseinstitute.org/Grocery%20White%20Paper%202008.pdf. Accessed October 19, 2011.

[12] R. Hasson, A. Leiman, M. Visser, The economics of plastic bag legislation in South Africa. South African Journal of Economics 75(1) (March 2007).

[13] L. Kadonga, Plastic grocery bags: the ecological footprint. Available at: http://www.vipirg.ca/publications/pubs/student_papers/05_ecofootprint_plastic_bags.pdf Accessed September 7, 2011.

[14] J. Kikang, M. Visser, Behavioral response to plastic bag legislation in Botswana. Environment of Development. 10-13 (May 2010).

[15] J.L. Lusk, D. Hudson. Willingness to pay estimates and their relevance to agribusiness decision making. Review of Agricultural Economics 26 (2) (2004) 152–169.

[16] K. Miller, Student attitude and action regarding the single-use plastic shopping bag on The University of Alabama campus. Unpublished thesis, University of Alabama (2011).

[17] W.E. Oates, Green taxes: can we protect the environment and improve the tax system at the same time? Southern Economic Journal 61 (4) (April 1995) 915-922.

[18] K. Painter, R. Scott II, P. Wandschnieger, K. Kasavant, Using contingent valuation to measure user and nonuser benefits: an application to public transit. Review of Agricultural Economics (2002) 394-409.

[19] E. Ritch, C. Brennan, C.McLeod, Plastic bag politics: modifying consumer behavior

for sustainable development. International Journal of Consumer Studies ISSN 1470-6423 (2009).

[20] J.R. Romer, The evolution of San Francisco's plastic-bag ban. Golden Gate University Environmental Law Journal 1 (2008) 439-465.

[21] R. Somanathan, K.Gupta, Understanding the consumer demand for plastic bags in India- evidence from an experiment in Delhi. Delhi School of Economics. (2009)

[22]S. Strife, Reflecting on environmental education: where is our place in the green movement? The Journal of Environmental Education 41(3) (2010) 179–191.

[23] U.S. Census Bureau. American Fact Finder 2010. Available at www.factfinder2.census.gov. Accessed December 2011.

[24] U.S. International Trade Commission, Polyethylene retail carrier bags from Indonesia, Taiwan, and Vietnam. Publication 4080 (2009).

[25] L.J. Williamson, It's not my bag, baby! On Earth: Environmental Politics People 25 (2) (June 2003) 32-34.

[26] J.M Wooldridge, Introductory Economics: A Modern Approach. South-Western College Pub; 2nd edition, Cambridge, 2002.

[27] H.-L. Yang, R. Innes, Economic incentives and residential waste management in Taiwan: an empirical investigation. Environmental & Resource Economics 37 (2007) 489–519.

APPENDICES

Appendix A: Survey Materials

1. Copy of Postcard Used for Gathering Participants:

Want to further science and have a chance at winning a $100 gift card to Lowe's? Please fill out our survey regarding plastic bag use in Logan, Utah. Respondents should be over 18 years of age and be responsible/co-responsible for grocery shopping decisions. This survey data will be used for a Utah State University graduate student's thesis. Please take 10-15 minutes to complete a web survey at this site:

www.surveygizmo.com/xxx/

Thank you!

2. Online Survey Instrument

Hello and welcome to the survey regarding reusable and plastic bag use in Logan, Utah. This survey should take approximately 10-20 minutes to complete, depending upon your awareness level and interest in this issue. The survey has been designed by a graduate student in the Department of Applied Economics at Utah State University (USU). The results will be analyzed in fulfillment of the student's Master's thesis. Since nowhere in the survey is your name, address, phone number, or email requested, your responses will be confidential. The information will be used solely for academic analysis at USU. We request that you be 18 years or older, and that you are the person in your household who is either responsible, or shares in the responsibility, for doing the household's grocery shopping on a regular basis.

One lucky respondent will win a $100 gift card to Lowe's Home Improvement Store just by successfully completing the survey and being randomly drawn from the survey's pool of respondents. The winner of the $100 gift card will be drawn on October 15th, 2011 (the last question on this survey provides instructions on how to enter the drawing and how you can find out if your household is the lucky winner).

Background Information Cache Valley businesses currently use over 100,000 plastic bags per week (personal correspondence with the Managers of Lee's Marketplace, Fresh Market, Smith's, and Wal-Mart during the summer of 2011). According to a recent study published by Convery et al. [7], plastic bags are a major source of litter in cities across the US and throughout the world. In response to this problem, there have recently been programs implemented in places such as Washington DC and Ireland that have applied a per-bag fee to try and discourage their use. Other programs have been proposed in Oregon and California [14]. A plastic bag fee is applied at the time groceries are purchased on a per bag basis.

An alternative to charging a fee per bag has been for grocers to promote the increased use of reusable bags by giving customers per-bag credits for using their own reusable grocery bags for grocery shopping. Reusable bags are defined as bags meant for multiple use that are made of canvas, cloth, or some other washable fabric. The average cost of a reusable shopping bag in Cache Valley is around $1.25 per bag. A reusable bag credit or subsidy is currently occurring at local grocers such as Fresh Market, Lee's Marketplace, and Smith's here in Cache Valley.

If you are interested in learning more about existing plastic bag ordinances, here is a link

discussing the pros/cons of reusable bag use: http://plasticvpaper.weebly.com/reusable---pros--cons.html

Here is a link explaining the Washington DC plastic bag policy: http://abcnews.go.com/Politics/washington-dc-charge-disposable-bag-fee/story?id=9456761

We begin the survey by asking you questions regarding your household's current use of reusable bags at the grocery store. Again, by "reusable bags" we mean only bags that are designed and manufactured for multiple reuse, and made of fiber, cloth, or another machine-washable fabric.

1. Before participating in this survey, had you ever heard of using reusable bags for grocery shopping?

- □Yes
- □No
- □Unsure

If question #1 is answered yes:

2. Have you or anyone in your household ever used, or are currently using, reusable shopping bags for grocery shopping?

- □Yes
- □No

□Unsure

3. Approximately how often do does your household use reusable bags for grocery shopping?

□All shopping trips.

□More than half of shopping trips.

□Less than half of shopping trips.

□My household does not use reusable bags.

□Unsure

4. Do you think using reusable bags helps to reduce the amount of non-reusable bags (plastic or paper) that end up in the Logan/Cache Valley landfill?

□Yes

□No

□Unsure

5. If reusable bags were available free-of-charge from your local grocer or another source in town would your household use them more frequently?

□Yes

□No

My household already uses reusable bags for all grocery transactions

6. Does your household currently recycle the plastic bags that are provided by your grocer at the cash register?

□Yes

□No

□Unsure

My household does not use any plastic bags provided by the grocer.

If question #2 is answered yes:

Grocery stores such as Lee's Marketplace and Smith's offer incentives to get customers to use more reusable bags. These incentives have traditionally been small amounts (e.g., 5 cents per reusable bag) subtracted from your grocery bill. Before you answer this question, please think about 1) your household income, 2) your household's monthly grocery budget, and 3) how many reusable bags your household currently uses at the grocery store on shopping trips.

7. If your grocer provided a subsidy of $0.05 (5 cents) per reusable bag that you would bring from your home would your household switch to using reusable bags for all grocery shopping trips?

□Yes

□No

□Unsure

8. On a scale from 0% to 100% (with 0% indicating "completely unsure" and 100 indicating "completely sure") how sure are you of the answer you have provided to the previous question? (please provide a whole number i.e. 25, 50, 75) *

If question number #2 is answered no or unsure:

The next question asks you about your household's willingness to switch from using plastic bags to using reusable grocery bags instead. As you consider your answer to this question, please keep in mind that sometimes what people say their households are willing to do in a hypothetical survey like this one differs from what they actually do when given the opportunity to do it in a real situation. Therefore, as you read the next question, please imagine your household actually facing the situation described in the question.

7. If your grocer begins charging you $0.10 (10 cents) per plastic bag used at the checkout to bag your groceries, would you switch to using reusable bags brought with you from home in future trips to the grocery store?

- My household would pay the $0.10 (10 cents) per plastic bag.
- My household would switch to reusable bags.
- Unsure

8. On a scale from 0% to 100% (with 0% indicating "completely unsure" and 100% indicating "completely sure") how sure are you of the answer you have provided to the previous question? (please provide a whole number i.e. 35,50, 75)

If question #3 is answered “all shopping trips”:

Local grocery stores such as Lee's Marketplace and Fresh Market provide their customers subsidies for using reusable bags in the form of either cash (e.g., a per-bag cash credit on your grocery bill) or credits (e.g., points added to a customer loyalty card).

7. Is your household currently receiving a subsidy like these for using reusable bags?

□Yes

□No

Unsure

If Question #1 is answered no or unsure:

2. If reusable bags were available free-of-charge from your local grocer or another source in town would your household use them more frequently?

□Yes

□No

□Unsure

3. Does your household currently recycle the plastic bags that are provided by your grocer at the cash register?

□Yes

□No

□Unsure

4. Do you think using reusable bags helps to reduce the amount of non-reusable bags (plastic or paper) that end up in the Logan/Cache Valley landfill?

□Yes

□No

The next question asks you about your household's willingness to switch from using plastic bags to using reusable grocery bags instead. As you consider your answer to this question, please keep in mind that sometimes what people say their households are willing to do in a hypothetical survey like this one differs from what they actually do when given the opportunity to do it in a real situation. Therefore, as you read the next question, please imagine your household actually facing the situation described in the question.

5. If your grocer begins charging you $0.10 (10 cents) per plastic bag used at the checkout to bag your groceries, would you switch to using reusable bags brought with you from home in future trips to the grocery store?

My household would pay the $0.10 (10 cents) per plastic bag.

- My household would switch to reusable bags.
- Unsure

6. On a scale from 0% to 100% (with 0% indicating "completely unsure" and 100% indicating "completely sure") how sure are you of the answer you have provided to the previous question? (please provide a whole number i.e. 35,50, 75)

Demographic Information

We conclude this survey with a few questions about you and your household that will aid in the statistical analysis of the information you and all the other participating households have provided. You are under no obligation to answer a question that you might feel uncomfortable with. Again, all of your responses to the questions on this survey are anonymous and confidential.

21. What is your gender?

- Male
- Female

22. In what year were you born?

23. What is the highest level of education you or anyone else in your household has completed?

24. What is your household's annual income?

25. What is your marital status?

26. How many people currently live in your household (including children)?

27. Of the people currently living in your household, how many are over the age of 18?

28. How do you define your ethnicity?

29. This completes the survey. Again, thank you for your participation. If you would like to enter our drawing for the $100 Lowe's gift card, please enter your personal access code provided on the survey information page that brought you to this website (located on the bottom left of the paper). On November 7th, 2011, the winning code will be posted at this web address (http://usereuseableandwin.blogspot.com) with further instructions on how to claim your prize.

Appendix B Descriptive Statistics and Variables Defined

Variables Defined

VARIABLE	VARIABLE DESCRIPTION
pbtaxa	WTP question. Accepts plastic bag tax at random level =1, 0 if rejects
taxbid	tax bid level
subbid	subsidy bid level
rbsuba	WTA question. Accepts subsidy at random level = 1, 0 if rejects
pbrecy	recycles plastic grocery bags = 1, no = 0
rbfree	if reusable bags were free, would use more often =1, if no =0
rblandf	reusable bags decrease size of landfill = 1 yes, or 0= no
sex	1 = male, 0 = female
lowinc	Income $0-$25,000 = 1, $25,000+ = 0
midinc	Income $25,001- $75,000 =1, $75,000+ = 0
young	Age 18-32 = 1, 33+ = 0
middle	Age 33-55 = 1, 56+ = 0

1. WTP

Variable	Obs	Mean	Std. Dev.	Min	Max
rblandf	63	.8730159	.3356296	0	1
rbfree	63	.8571429	.3527378	0	1
pbrecy	63	.7301587	.4474425	0	1
taxbid	63	.1690476	.1189431	.05	.35
pbtaxa	63	.1428571	.3527378	0	1
certtax	63	.8168254	.1810705	.08	1
age	61	36.72131	14.39575	18	78
young	61	.4262295	.498632	0	1
middle	61	.3442623	.4790701	0	1
old	61	.1967213	.4008188	0	1
sex	60	.2833333	.4544196	0	1

totnhh	61	3.081967	1.441008	1	8
white	63	.9047619	.2959013	0	1
nonwhite	63	.0952381	.2959013	0	1
lowinc	60	.6166667	.4903014	0	1
midinc	60	.2833333	.4544196	0	1

2. WTA

Variable	Obs	Mean	Std. Dev.	Min	Max
rbsuba	102	.8431373	.3654672	0	1
rblandf	102	.9215686	.2701769	0	1
rbfree	102	.7745098	.4199685	0	1
pbrecy	102	.754902	.4322695	0	1
subbid	102	.1730392	.1054626	.05	.35
certsub	102	.8343137	.1958607	0	1
age	94	38.68085	13.20249	18	72
young	101	.4356436	.498314	0	1
middle	101	.3465347	.4782393	0	1
old	101	.181188	.3927562	0	1
sex	93	.2903226	.4563714	0	1
totnhh	92	3.163043	1.762099	0	9
nonwhite	101	.1386139	.3472666	0	1
white	101	.8613861	.3472666	0	1
lowinc	92	.5	.5027397	0	1
midinc	92	.326087	.4713482	0	1