DRAFT: Conspicuous Conservation: The Prius Effect and WTP for Environmental Bona Fides*

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"The wish to become proper objects of this respect, to deserve and obtain this credit and rank among our equals, may be the strongest of all our desires." - Adam Smith

1 Introduction

Veblen explained in 1899 that "in order to gain and hold the esteem of man it is not sufficient merely to possess wealth or power. The wealth or power must be put in evidence, for esteem is awarded only on evidence." Since then, a considerable economics literature has explored the concept of conspicuous consumption and its implications in various settings, with particular focus on purchases that signal prestige, luxury and exclusivity.[1] While consumption of luxurious automobiles, jewelry and apparel surely still afford desired social status in the 21st Century, evolving social norms suggest esteem can be attained through the demonstration of certain kinds of austerity–specifically austerity that minimizes the environmental impact of consumption. In fact, amid heightened concern about environmental damage and global climate change, costly private contributions to environmental protection increasingly confer status once afforded only through ostentatious displays of wastefulness. Consumers may, therefore, undertake costly actions in order to signal their type as environmentally friendly or "green." The status conferred upon demonstration of environmental friendliness is sufficiently prized that homeowners are known to install solar panels on the shaded sides of houses so that their costly investments are visible from the street. We call this behavior "conspicuous conservation."

Home solar panel installation and car ownership decisions are two of the most visible consumption decisions households make. Since the U.S. introduction of

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[1] See for instance: Leibenstein [1950], and more recently Frank [1985], Basu [1987], Braun and Wicklund [1989], Ireland [1998]. More generally, other recent studies, including Akerlof [1980], Bernheim [1994], Stephen et al. [1992], Cole et al. [1992], Fershtman and Weiss [1993], Glazer and Konrad [1996] explore the impact of status consciousness on economic behavior.

the Toyota Prius in the U.S. in 2001, a growing number of vehicle models have been introduced with features that reduce environmental impacts, particularly greenhouse gas emissions. They include small and light cars with conventional engines (like the SmartCar), alternative fuel cars (like the Chevrolet flex-fuel fleet), and hybrid cars (like the Prius, the Honda Civic Hybrid, and others). Until the reintroduction of the Honda Insight in 2010, the Prius was the only model that at once provided the standard features consumers are accustomed to in modern vehicle design (climate control, four doors, luggage space, etc.), environmental amenities, and a design unique to the model.

The Prius was introduced into the U.S. in 2001 and today is the clear leader among 24 different hybrid models available in the U.S. In fact, 48% of the 290,271 hybrid cars sold in the U.S. in 2001 were Priuses. The success of the Prius can certainly be attributed to an aggressive and innovative marketing effort by Toyota and the equity in the Toyota brand. However, national marketing effort does not explain why ownership increases in green communities disproportionately relative to other hybrid cars, conditional on the green attributes of the models. It does not explain why, for instance, Toyota Camry Hybrid ownership does not increase proportional to the Prius after conditioning on green attributes. Likewise, the Civic Hybrid achieves a green rating that is nearly identical to the Prius from a number of sources, including the American Council for an Energy Efficient Economy's "Green Book," yet the Civic is underrepresented in green locales.

The unique design of the Prius is not accidental. Toyota executives instructed its designers to develop something unique, regardless of the quality of the styling. Prius design has been described as utilitarian as it seeks to maximize on aerodynamics. Still, its design made it unique among the class of green cars that also provide the comfort and performance characteristics to which consumers in the U.S. have become accustomed. When Toyota updated the Prius in 2009, it kept the outside styling virtually the same[2]. The Honda Civic Hybrid and other hybrid models, in contrast, share body styling with the other trims in the model class that have conventional drive types. The Hybrid trims of these models typically carry only a badge on the side or rear of the vehicle indicating their type. The Prius has, therefore, historically provided the most powerful signal of the owner's affinity for the environment of any vehicle in the U.S.

In this paper, we test for the presence of a conspicuous conservation effect in vehicle purchase decisions and estimate the willingness to pay for the "Green Halo" generated by signaling green type with a Prius purchase. To do this, we observe that the value of the signal is increasing in the predisposition of one's neighbors toward environmental protection. All else equal, then, a Prius is more valuable in communities with a strong green ethos like Berkeley, Calif. than in

[2]The Honda Insight was first introduced in 1999, two years before the Prius and four years before the current generation of Prius. Still, it was a two-door subcompact car that sacrificed on amenities available in most passenger cars at the time. The Insight was re-introduced in 2010 as a four-door sedan, joining the class of four-door hybrids with unique model names and designs.

communities with greater heterogeneity in attitudes toward the environment, like, for instance, Bakersfield, Calif. Thus, while shares of all green car models are expected to be greater in green communities than "brown" communities, to the extent individual green purchases are motivated, at least in part, by efforts to signal type, then Prius share should be disproportionately greater than other green models in these communities because of its unique capacity to signal green type.

We use observed variation in model ownership rates across communities in Colorado in order to identify a statistically and economically significant conspicuous conservation effect. We relate these findings to a growing literature on green markets and private provision of public goods. Results suggest private provision of environmental preservation need not rely on altruism in the traditional sense, but can instead by achieved by those with traditional neoclassical utility functions who seek economic and non-economic returns from status achieved by signaling "green" type.

We are unaware of any research that has heretofore empirically tested for conspicuous conservation effects, though the concept has drawn popular media attention, particularly with respect to the Prius (Bedard 2007-07, Maynard and Bunkley 2007-07-04, Samuelson 2007-07-25, Cloud 2009-06-03). The New York Times reported in 2007 on a marketing research firm's survey results in which 57% of Prius buyers said their main reason for choosing the Prius was becuase "it makes a statement about me" (Maynard and Bunkley 2007-07-04).

This paper proceeds in Section 2 with a brief review of the theories related to conspicuous consumption and green markets in order to motivate the concept of conspicuous conservation. The self-interested motivations for private provision of public goods is also related to the vast literature on altruism. Section 3 presents our econometric model and data, while Section 4 contains results. Section 5 estimates the willingness to pay for the green halo. The final section concludes.

2 Status Seeking and Conspicuous Conservation

Economists since Veblen have endeavored to explain anomalies in consumption behavior, like upward sloping individual demands and "non-additive" market demands, by appealing to the notion that status is acquired or retained by individuals who engage in costly signaling to differentiate their types (Leibenstein [1950], Frank [1985], Ireland [1998], Glazer and Konrad [1996], Ireland [2001], Barclay and Willer [2007]). Much of this work has focused on ostentation as a signal of affluence and has provided a theoretic understanding of consumer demand for luxury goods that are functionally equivalent to less costly alternatives. Ireland [1998] and Bernheim [1994], for instance, were concerned with "bizarre" premia for designer fashions and high expenditures on cars.

Relatively more recent is the treatment of private provision of public goods in status-signaling models. Glazer and Konrad [1996] argued status-seeking behavior explained anomalies in charitable contributions like high rates of giving and low rates of anonymous contributions while conventional theory did not. But like much of the economics literature on status-seeking, they presumed charitable giving was intended to signal wealth when conspicuous consumption was unobservable or subject to imitation.

Economists have only within the past decade begun to consider the implications of status seeking when individuals attempt to signal their selflessness, a phenomena the psychology literature has termed competitive altruism (Hawkes et al. [1993], Roberts [1998], Barclay and Willer [2007], Van Vugt et al. [2007]). Though it inspires behavior consistent with other-regarding preferences and utility from the "warm glow of giving," motivations that are familiar to economists as pure altruism and impure altruism (e.g. Becker [1974], Andreoni [1989, 1990]), respectively, competitive altruism is distinct from standard notions of altruism in economics in that it is self-interested in the traditional sense. A competitive altruist contributes to the public good in order to attain status that can generate economic rewards and intrinsic value (Hardy and Van Vugt [2006], Van Vugt et al. [2007].

Benabou and Tirole [2006] defined a reputational motivation, in addition to intrinsic and extrinsic motivations, in order to explain the decline in prosocial behavior when it generates extrinsic rewards or when it moves from the public sphere to the private domain (see Frey and Oberholzer-Gee [1997], Frey and Jegen [2001] for surveys). The crowdout of intrinsic motivations by extrinsic rewards (and punishments) has been hypothesized and documented in a number of contexts. Schoolchildren were shown to collect less charity when they were given performance bonuses (Gneezy and Rustichini [2000b]), and parents became more delinquent in terms of on-time retrieval of their children from childcare centers when fines were imposed for late pick-ups (Gneezy and Rustichini [2000a]). Provision of prosocial behavior also declines when it is removed from the public sphere and increases when it is made public. Funk [2010] showed, for instance, that voter participation did not increase in Switzerland with the introduction of mail voting and that voting rates declined in small communities, despite the reduction in the time-inclusive costs of voting. Similarly, when individual voter participation is shared with neighbors, participation rates increase [Gerber et al. 2008].

As preferences for environmental protection and, particularly, climate change mitigation, have become stronger and more prevalent, the market for green products that jointly provide private benefits and public goods has grown (Kotchen 2006). While the green economy comprises only 2% of the total economy (U.S Commerce Department 2010), by 1999 green products accounted for 9% of all new product introductions (Marketing Intelligence Service 1999). In 2006, the green economy was valued at $228 billion and is expected to reach $1 trillion by 2050. Surveys show as many as one third of consumers are willing to pay a premium for products with green characteristics. Such preferences are observed in markets for renewable residential energy, organic foods, eco-labelled household products, and hybrid cars, among others.

Intrinsic motivation can explain positive willingness to pay for green product characteristics. But it does not explain the success of the Prius relative to the

Civic Hybrid and other top-environmentally-rated cars. Much as the paucity of anonymous charitable giving that Glazer and Konrad observed suggested the presence of status-seeking motives, so too does the success of highly visible green investments demand an alternative to conventional altruism explanations. To our knowledge there is no research that formally tests for the presence of conspicuous conservation in green markets, though Griskevicius et al. [2007],Goldstein et al. [2008] and Griskevicius et al. [2010] demonstrated the importance of social norms in motivating conservation.

A number of studies have shown that social pressure induces environmentally-preferred behaviors. Homeowners reduce energy consumption after receiving reports that compare their usage to neighbors (Allcott 2009, Ayres et al. 2009), and hotel guests reduce demand for clean towels when they are told the majority of their peers have done likewise [Goldstein et al. 2008].

In addition, anecdotal evidence from popular media reports and opinion surveys lend credence to theories of status seeking among Prius owners. In a related context, behavioral economists have informally postulated that homeowners over-invest in solar panels and under-invest in other green home improvements like additional insulation and window caulking because the former are conspicuous and the latter are not. Dastrop et al. [2010] show that the housing price premium for residential solar installations is increasing in the greenness of neighbors.

The success of green signaling hinges on two conditions. First is the observability of costly conservation effort, which may be reflected by willingness to pay premia for green product characteristics or by willingness to accept lower quality for products that generate less environmental damage in production or end-use than conventional products. Second is the existence of separating equilibria that permit green types to distinguish themselves from others. In wealth signaling models, consumption of luxury items permits separation because declining rates of marginal substitution make high expenditures on ostentation (at the expense of other consumption) more tolerable to the affluent (Bernheim 1994). Likewise, in a model of environmental signaling, tolerance of price premia for green goods or acceptance of diminished product quality for environmental benefits is increasing in the strength of preferences for the environment. One who derives utility from reductions in greenhouse gas emissions will sooner settle for the utilitarian design, cloth seats, and loss of performance of a Prius than one who is indifferent to climate change mitigation. Thus, the cost of sending the green signal is lower for those who are predisposed to favor environmental goods. Similarly, this same cohort will attach a greater utility to being perceived by peers to have established "environmental bona fides".

3 Empirical Methods

In order to test empirically for the presence of status seeking in vehicle choice and to estimate willingness to pay for the "green halo" associated with hybrid vehicle ownership, we exploit spatial variation in vehicle model market share and in preferences for conservation and environmental protection. The critical assumption of this paper is that the value of the Prius signal, i.e the halo effect, is increasing in the greenness of the community in which the owner resides. It seems natural that the benefits to signaling one's green type should be greater the more one's peers are concerned about environmental protection. Kahn [2007] documented the clustering of Prius and Hummer ownership and showed that communities in California with more registered Green or Democrat party members are home to more Priuses. Communities with more Republicans have more Hummers.

Were there no status-seeking motivations for hybrid demand or were the Prius less distinctive, we would expect to see ownership patterns like those described by Kahn, with hybrid cars enjoying greater market share in green communities. But the pattern should exist across all hybrid models, with the market share of hybrid models equally covarying with measures of community environmentalism. If instead Prius owners derive utility from the halo effect that is unique to a Prius, then, conditional on vehicle characteristics, the greater value of the halo in greener communities should cause Prius ownership to increase disproportionately in those areas relative to other hybrids like the Civic.

Following Kahn [2007] and Kahn and Vaughn [2009], we measure the relative greenness of communities using election data. As has been observed in a number of settings, political ideology is highly correlated with environmental ideology: Republican communities drive more Hummers and fewer Priuses [Kahn 2007]; Republican household energy consumption is less responsive to peer comparisons and may increase whereas Democrat households decrease consumption on average (Costa and Kahn 2010); households in highly Democratic and Green communities pay higher premia for solar panels (Dastrop et al. 2010); per capita energy consumption has been trending upwards in majority Republican states but relatively flat in majority Democrat states; and public opinion surveys show Republicans are more than three times as likely as Democrats to think that the seriousness of global warming is exaggerated in the news media (Loewenstein 2009).

Green party participation rate is also considered to be an important indicator of the strength and prevalance of preferences for environmental protection. Strategic voting, however, limits the Green party share of the electorate. Many environmentalists participate in Democratic politics to ensure their votes have the greatest impact on elections. In this analysis, we rely on records regarding voter party registration to develop our measures of market greenness. We define markets at the zip code-level, the smallest geographical breakdown for which car share data are available.

We consider two related econometric specifications. The first is a reduced-form fixed-effects model that is effectively a regression-based difference in difference (DD) model with partial treatment. To motivate the full model, we first propose a two-by-two DD model in which we consider the market shares for the Prius and the Civic Hybrid in a "green" market and in a "brown" market. Assume that the unique design of the Prius makes it a purchase that signals green status. Further assume that the Civic Hybrid is a perfect control for all attributes of the Prius except that it does not have a design that uniquely signals the owner's green type. Further assume the cars are purchased in a green market and in a brown market that is identical to the green market apart from preferences over the environment. Environmental preferences can be thought of as the policy parameter in the context of the treatment effects literature. Then the DD estimate of the conspicuous consumption effect on market shares is given by:

$$\hat{\delta} = (s_{P,G} - s_{P,B}) - (s_{C,G} - s_{C,B}),$$

where s is market share and subscripts P and C denote Prius and Civic, respectively, and subscripts G and B denote green and brown markets respectively.

Accepting the difficulty of identifying markets that are otherwise identical apart from greenness, and in order to exploit observations across a number of markets, we augment the 2x2 model to consider a regression-based 2xN model, incorporating all zip codes (in the N-dimension), and use market fixed effects to condition on market characteristics other than the policy variable. We estimate:

$$s_{ij} = \xi V_j + \gamma D_i + \beta D_i * VOTE_j + \varepsilon_{ij} \tag{1}$$

where, for $i \epsilon \{\text{Prius}, \text{Civic}\}$, the V_j are market fixed effects, D_i is a Prius indicator, $VOTE_j$ is a measure of the greenness of the market (i.e. the strength of the policy), and ε_{ij} is an idiosyncratic error. The coefficient of interest is β, which represents the change in Prius market share due to a one-unit change in $VOTE$. Multiplying β by the mean of $VOTE$, we obtain an estimate, $\hat{\hat{\delta}}$, of the average conspicuous conservation effect on Prius share.

Finally, we specify a full model that incorporates many car models and controls for model heterogeneity with model fixed effects and for heterogeneous effects of green car characteristics according to market preferences for the environment by interacting a measure of a model's greenness, $GREEN_i$, with $VOTE_j$. This serves to control for the Prius attributes apart from the unique design that could cause its demand to increase disproportionately in green markets relative to other models. Specifically, we consider:

$$s_{ij} = \delta_i D_i + \xi_j V_j + \gamma GREEN_i * VOTE_j + \beta PRIUS_i * VOTE_j + \varepsilon_{ij}, \tag{2}$$

where interest is again in the estimate of β and where an estimate of the average conspicuous conservation effect is again obtained by multiplying the estimate of β by the mean vote share.

The second model draws on the vast literature on econometric estimation of demand parameters in discrete choice, differentiated product settings, particularly the work of Berry et al. [1995], Berry et al. [2004] and Petrin [2002] who adapt discrete choice multinomial logit models for use with aggregate, market-level data rather than observations on individuals' choices. A central concern in these models is the endogeneity of price, which arises because price is likely to be correlated with vehicle attributes that are unobservable to the econometrician and thus are relegated to the model error. We use the control-function approach of Petrin and Train [2010] to account for endogeneity. Specifically, we estimate a nested logit model where products are grouped into predetermined, exhaustive, and mutually exclusive sets, according to their vehicle type - car, truck, mini-van, or SUV. By grouping the observations in this way we decomposed the error term into an i.i.d. shock plus a group-specific conponent. This implies that correlation among brands within a group is higher than across groups and allows for more reasonable substitution paterns than a simple logit model.

Berry [1994] derived a simple expression for the mean utility levels and showed that demand perameters for price and product characteristics could be estimated from a linear instrumental variables regression of the differences in log market shares on product characteristics, price, and the log of within group share:

$$ln(S_j) - ln(S_0) = \chi_j \beta - \alpha p_j + \sigma ln(S_{j/g}) + \varepsilon_j \quad (3)$$

where S_j is the share of product j in the market, S_0 is the share of the outside good in the market, χ_j is a matrix of product characteristics and demographic variables, and $S_{j/g}$ is the within group share of product j. We incorporate an outside option in two ways. In the first specification, we consider the market to be all workers 16 years or older. In the second, we consider the market to be all residents. In the equation above, both p_j and $S_{j/g}$ are endogenous and thus suggest the need for instrumental variables. To properly IV for the within group share we used mean product characteristics for the other products within each product's group [Berry 1994]. These mean values should be exogenous to the model but correlated with the group share variable ($S_{j/g}$). Instead of using traditional IV methods to correct for the endogeniety of price, we used a control-function approach as described in (Petrin 2010). The idea behind the control function approach to engodenous variables is to derive a proxy variable that conditions on the part of the dependant variable that is correlated with the error term. If this is done correctly then the remaining variation in the endogenous variable will be independent of the error and standard estimation approaches will be consistent. This model proceeds in two steps. First we regress the remaining endogenous variable, price (p_j) on observed product cost characteristics. The residuals of this regression are retained and then used to calculate the control function. In the second step, the choice model is estimated with the control function entering as an extra explanatory variable and with instramental variables entering for $S_{j/g}$.

3.1 Data

We obtained data on all registered vehicles in the state of Colorado by public records request of the Department of Licensing. This generated 3.9 million vehicle identification number (VIN) records matched to one of 495 5-digit zip codes in the state. We used a third party data set to decode the VINs and obtain the make, model, year of the car in each vehicle record, as well as the other characteristics used in this analysis, including the U.S. Environmental

Protection Agency's fuel economy ratings. We define products by iteration of make and model (i.e. model generation). In order to reduce dimensionality, we do not treat each model year as a distinct product but rather group models by year so long as the model design is unchanged.[3]

We generate the average characteristics of each "product" as defined here and drop products with Manufacturer Suggested Retail Price (MSRP) greater than $100,000. This leaves us with 792 products. We use Census 2000 data to incorporate consumer heterogeneity into the discrete choice specifications. Our measure of market greenness is voter party registration data obtained from the Colorado Secretary of State pursuant to a public records request. We use green rating to condition for car characteristics that could have a heterogeneous effect on market share that varies with market greenness. For this rating, we first used MPG as the principal input into green ratings. Summary statistics are reported in Table 1.

<<INSERT SUMMARY STATS HERE>>

4 Results

Based upon estimation of the fixed effects model in (1) and (2), we determine that there is a statistically and economically significant conspicuous conservation effect that accounts for between 16% and 57% of Prius market share on average in Colorado, as reported in Table 2. We estimate (1) and (2) using both Green party vote share and Democratic party vote share as measures of attitudes toward the environment.

The coefficient on the interaction between the Prius indicator and the vote share variable is positive and significant in each instance. We calculate the magnitude of the conspicuous conservation effect as a percent of Prius share by multiplying the estimated coefficients by the mean party share across zip codes in Colorado, dividing by the Prius share, and converting to a percent. For consistency, we also separately interact an indicator for Civic Hybrid and for Toyota Camry Hybrid with vote share and we find no significant conspicuous conservation effect.

The regression results shown in Table 3 are mean parameter estimates for the vehicle demand system estimated by the nested logit specificantion in (3). The coefficients are for the most part consistent across both market definitions and consistent with economic theory. For example, the price variable, MSRP is negative in both models indicating that higher prices reduce consumer's mean utility. In both models we were able to control for a number of demographic variables including average household size, median income, percent of the population who take public transportation and who carpool, and the percent of the population who have a daily commute in excess of 45 minutes. The coefficient of primary interest in is the interaction of the Prius dummy variable with the share

[3]For instance, the 2010 Toyota Camry is the sixth generation of Camry ever produced. The sixth generation was first introduced in 2007. We group Toyota Camry's from model years 2007-2010 as one product.

Table 1: Data Summary

Variable	Description	Mean	Std. Dev.
doors	Number of door	3.70	0.70
msrp	Manufacturer's suggested retail price	30429.13	12417.05
length	Vehicle length	193.87	22.42
height	Vehicle height	65.29	8.51
width	Vehicle width	74.24	5.88
mpg	Miles per gallon on highway	21.29	9.75
avg_MSRP	Average MSRP for vehicle model	30284.23	11404.28
avg_length	Average length for vehicle model	193.72	21.96
avg_height	Average height for vehicle model	65.29	8.49
avg_doors	Average doors for vehicle model	3.70	0.64
avg_curb_weightt	Average curb weigh for vehicle model	4066.10	1070.60
avg_cylinderss	Average engine size in cylinders for model	5.93	1.42
vehicle_type 1	Dummy variable for cars	0.47	0.50
vehicle_type 2	Dummy variable for SUVs	0.30	0.46
vehicle_type 3	Dummy variable for trucks	0.17	0.38
vehicle_type 4	Dummy variable for mini-vans	0.06	0.24
population	Population	15934.87	14980.34
household_size	Average household size	2.57	0.34
age	Median age	36.00	4.79
family size	Median family size	3.05	0.25
Income	Median income	48235.43	16406.95
workers	Share of population that works	0.11	0.20
workers 16 over	Number of workers age $>$ 16	8185.24	7849.19
carpool	Share of poluation that carpools to work	0.13	0.05
pub_transport	Share of population that uses public transportation	0.02	0.03
commute45	Share of population with a daily commute $>$ 45 minutes	0.32	0.15
commute30	Share of population with a daily commute $>$ 30 minutes	0.32	0.15
college	Share of population with a college degree	0.36	0.12
grad_school	Share of population with graduate degree	0.07	0.05
female	Share of population that is female	0.33	0.04
Party share Democrat	Share of population registered Democrat	0.30	0.11
Party share Green	Share of population registered Green	0.002	0.002

Table 2: Fixed Effects Results

	(1) Democrat	(2) Green
	'2 x N' Model	
PRIUS*VOTE	0.0094***	1.01385***
	(0.0007)	(0.1163)
	[47.55]	[37.6]
	Full Model	
PRIUS*VOTE	0.0091***	0.3356***
	(0.0020)	(0.0852)
	[57.30]	[16.60]

Robust standard errors in parentheses
Mean conspicuous consumption effect as percent of share in brackets
*** p<0.01, ** p<0.05, * p<0.1

of democratic voters. It is positive and significant in both models, re-enforcing the results inTable 2 and indicating that the mean utility for a Prius vehicle is greater in more democratic zip codes. The coefficient estimates for SUV and mini vans are positive, which indicates that, controlling for demographic averages, mean utility levels are higher for both types of vehicles. Similarly, mean utility levels are lower in zip codes that have more public transportation users and carpoolers.

5 Estimating WTP

In order to derive estimates of the mean willingness to pay for the status signal afforded by Prius ownership, we assume a locally linear Prius demand and treat the conspicuous conservation effect as a demand shifter. We determine what magnitude of right shift in Prius demand would, for given price, generate an equilibrium market share equal to our model estimate of actual market share and then estimate the share without the green halo by subtracting that estimated effect from the observed share. This simple approach is illustrated in Figure 1, where the estimated market share is denoted by s_1 and the estimated market share in the absence of the conspicuous conservation effect is s_2. The value of the social signal is given by $p_2 - \text{MSRP}$.

We fit a locally linear demand equation using estimated price elasticities of demand for individual vehicle models from the literature [4]. Table 4 reports

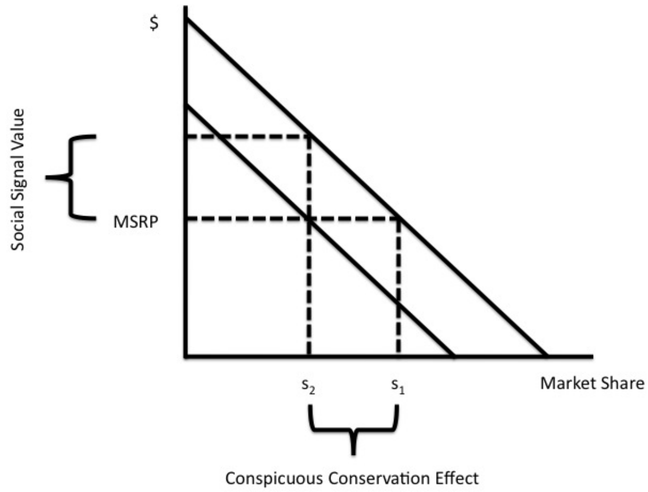
[4]Mannering and Manhassami 1985; Mannering and Winston 1985; Berry, Levinsohn, and Pakes 1995.

Table 3: Nested Logit Estimation Results

	(1)	(2)
PRIUS*VOTE	2.5189***	2.3428***
	(0.2942)	(0.2862)
VOTE	-2.5497***	-3.5474***
	(0.0549)	(0.0804)
MPG	0.0014**	0.0012**
	(0.0004)	(0.0005)
MSRP	-0.00002	-0.00007***
	(-0.00001)	(0.00001)
MSRP Income^2	-0.000006*	0.0000007
	(-0.0000005)*	0.0000005
Engine Size	0.3856***	0.3652***
	(0.0124)	(0.0128)
Vehicle Type 2	0.2376***	0.2312***
	(0.0090)	(0.0123)
Vehicle Type 4	0.4162***	0.3845***
	(0.0472)	(0.0586)
P07001	2.441024***	1.5910***
	(0.0647)	(0.0493)
P013001	0.0580***	0.1251***
	(0.0020)	(0.0023)
P033001	-1.8849***	0.1456**
	(0.0805)	(0.0726)
P053001	-0.00003***	-0.00003***
	(0.0000011)	0.000001
Work	-.2355***	0.0913***
	(0.0439)	(0.0328)
Carpool	-0.5269***	0.0226
	(0.1065)	(0.1713)
Public Transportation	2.6071***	-1.9988***
	(0.2690)	(0.2877)
Commute > 45 min	1.7710***	1.8574***
	(0.0312)	(0.0363)
college	4.5936***	4.0875***
	(0.1058)	(0.1243)
female	-1.6487***	-3.5398***
	(0.2098)	(0.2095)
residual from MSRP	0.00002***	0.000021***
	(0.000001)	(0.000001)
Within Group Share	-3.3477***	-3.0374***
	(0.2942)	(0.3086)

Bootstrap standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 1: Prius demand with and without the status signal



estimated mean willingness to pay for the Prius Halo in Colorado for each estimate of the estimated percentage share effect of conspicuous conservation and for each of three own price demand elasticities obtained from the literature. To our knowledge there are no elasticity estimates for the Prius or for individual hybrid models. We rely, therefore, on estimates elasticities for similar models. Specifically, Mannering and Hani [1985] estimated a Toyota Corolla elasticity of 1.59, while Mannering and Winston [1985] estimated a Corolla elasticity of 1.7. Honda Accord elasticities were estimated to be 2.0 and 4.8 by Mannering and Hani [1985] and by Berry et al. [1995], respectively. Because of the uniqueness of the Prius, it is expected its elasticity falls in the low end of this range.

We estimate that the mean willingness to pay in Colorado, where the mean Democratic party and Green party shares are respectively 0.303 and 0.002, is between \$345 and \$7,280. In all but two of the estimates reported in the table, WTP exceeds one thousand dollars. In Boulder, Colorado, where the Democratic party share is 0.55, the WTP is estimated to be between \$3,483 and \$13,346.

6 Conclusion

Using market-level data on vehicle ownership in Colorado, we have empirically identified a significant conspicuous conservation effect related to Toyota Prius demand. Such effects have been the subject of theory and discussion, but to our knowledge have not heretofore been tested empirically. Our results suggest that consumers are willing to pay up to several thousand dollars to signal their

Table 4: Estimated Mean Willingness to Pay for the Prius Halo (in dollars)

	Price Elasticity		
Percent Change in Share	-1.6	-2.0	-4.8
16.60	1,323.32	1,058.66	441.11
37.60	3,993.6	3,194.88	1,331.2
47.55	5,553.23	4,442.58	1,851.07
57.30	7,280	5,824	2,426.66

environmental bona fides through their car choice. Competitive altriusm, i.e. the social signaling motive, may, therefore, provide a strong impetus toward private provision of public environmental goods via purchase of impure public goods in the green market.

While much of the literature on conspicuous consumption emphasized the wastefulness of spending to signal wealth, conspicuous conservation may be social welfare improving. To some extent, private actions can substitute for government policies to yield social-welfare-improving environmental outcomes in the presence of market failures that under-value environmental amenities. However, the social welfare implications of conspicuous conservation depend upon substitution effects with respect to conservation effort. The social signaling motive can distort private incentives and generate conservation investment that is individually rational but not social welfare maximizing. For instance, economists have begun to question whether homeowners over invest in residential solar power because of its conspicuousness and underinvest in home insulation improvements, energy efficient heating and cooling systems, and window sealing because of the relative inconspicuousness of these investments. Policy, then, should endeavor to allign private incentives with behaviors that are in the public interest. This means subsidies should be targeted toward inconspicuous conservation in order to achieve an optimal mix of conservation effort. Furthermore, conspicuous-conservation goods enable their purchasers to signal their willingness to sacrifice to enhance the environment. Arguably the public subsidy of such goods diminishes their value in sending such signals, creating the possibility of the perverse outcome that subsidiziation of a good reduces demand for it.

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