# Promoting Recycling: Private Values, Social Norms, and Economic Incentives

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Individual behaviors that benefit the environment are potentially influenced by personal values of environmental quality, social norms that encourage proenvironmental actions, and economic incentives. Economic incentives often loom particularly large, including those that result from environmental policies. Less well understood are the respective roles of private values and social norms. Do people undertake proenvironmental actions more out of their personal valuations of the environment that might be characterized as warm glow effects or from the social norms that reinforce proenvironmental behaviors?

The least explored component of these determinants of proenvironmental behavior is that of social norms. We characterize social norms in terms of what is normatively appropriate rather than what is the conventional mode of behavior. There is a burgeoning economics literature modeling social norms, but not a commensurate empirical investigation of their practical importance. If norms do matter, what is the respective role of personal norms that a person imposes on others compared with the external norms that people perceive are imposed on them by others? To what extent are these social norms the result of legal regimes and regulatory policies that establish standards for behavior? Our empirical analysis estimates the role of these influences.

The empirical case study for this article is based on an analysis of recycling of plastic water bottles. Recycling policies are becoming increasingly prominent generally (see Thomas C. Kinnaman 2006), and plastic water bottle recycling is at the forefront of many recycling policy initiatives. Plastic water bottle recycling is of tremendous practical importance, as US sales of bottled water have grown rapidly, from around 20 billion bottles in 1997, to 36 billion in 2006, reaching 50 billion in 2008. This comprises nearly half of all polyethylene terephthalate bottles, and in 2006 accounted for more than 2 million tons of incinerated or landfill waste. Five states (California, Connecticut, Hawaii, Maine, and Oregon) have enacted bottle deposit laws for plastic water bottles, and such deposit legislation has been proposed or is pending in other states.

Economic incentives enter the consumer's recycling decision through the financial rewards for the return of their bottles for deposit and through laws and policies that alter the monetary and convenience costs of recycling. Factors unrelated to time and money costs also are present, as people may choose to recycle because of personal attitudes or because of their perception of social norms toward recycling. To capture the influence of personal values, we use data on personal attitudes toward the environment. Our data include unique empirical measures regarding the degree to which one values socially acceptable behavior in others compared with whether one believes others value that behavior. We will show that the private values reflected in becoming upset at neighbors not recycling are far more predictive of a person's behavior than the external norms reflected in their beliefs about what their neighbors might think of them.

We model the disposal mode for waste as a binary choice. Consider a decision between returning a bottle for deposit or disposing of it in the garbage. Once a person has chosen a disposal mode for that bottle, it will usually be desirable to continue to use that mode for additional bottles, producing a corner solution in terms of the recycling decision. We begin here with a simple theoretical model for returning

bottles for deposit versus disposing of them in the garbage. The conceptual structure is similar for other forms of recycling such as curbside, but those modes do not include a financial payoff for bottle returns.

Let each disposal mode have an associated fixed cost as well as a unit disposal or return cost per bottle. The cost of returning bottles for deposit is $(t_{d0} + t_{d1}n)w$, where $t_{d0}$ is the fixed time cost, $t_{d1}$ is the unit time cost per bottle, $n$ is the number of bottles returned, and $w$ is the opportunity cost of time given by the wage rate. Similarly, disposing of bottles in the garbage has an analogously defined time cost of $(t_{g0} + t_{g1}n)w$. Returning bottles for deposit also yields a deposit refund payment $p$ per bottle.

The disposal decision also entails nonpecuniary components. The overall nonpecuniary benefit $b$ that the person derives per bottle that is recycled depends on components that reflect both private values and social norms. We denote the warm glow environmental valuation component that recyclers receive by $e$, as individuals may derive utility from taking proenvironmental actions. Returning bottles for deposit may also enable the person to feel virtuous or morally superior to neighbors, based on personal norms, which we denote by $v$. Failing to recycle bottles may produce environmental guilt if they believe that they are not behaving in a way that is consistent with external norms for acceptable behavior. Thus, there is a per bottle unit green guilt cost $c$ of throwing the bottles away in the garbage. There also may be an income elasticity associated with environmental benefit valuations, which we expect to be positive if environmental quality is a normal good. The nonpecuniary benefit per bottle returned is $b(e, v, w)$, and the external norm guilt cost $c$ enters negatively in the disposal decision.

The choice to return bottles for deposit will be preferable to garbage disposal if

$$(1) \quad b(e, v, w)n - (t_{d0} + t_{d1}n)w + pn$$
$$> -cn - (t_{g0} + t_{g1}n)w.$$

If the household already uses both disposal modes so that fixed costs can be excluded, the bottle return condition becomes

$$(2) \quad b(e, v, w) + c + p > t_{d1} - t_{g1}.$$

The unit value of the private benefits stemming from environmental valuations, virtue, and the value of the averted guilt, plus the bottle deposit amount, must exceed any increase in the unit bottle time costs due to returning bottles for deposit as compared to disposal in the garbage.

Given the assumed linear structure of the recycling decision, it is straightforward to show, as in Viscusi et al. (forthcoming), that if it is desirable to recycle $n$ bottles then it will be desirable to recycle $n + 1$ bottles. Thus, one would expect the distribution of recycling amounts to be characterized by corner solutions in which people tend either not to recycle at all or to be diligent recyclers. There should be few households that are in the intermediate category of recycling a moderate amount. This discontinuous response is reflected in the recycling patterns documented in Viscusi et al. (forthcoming).

To examine the determinants of recycling decisions, we use an original dataset consisting of 608 households from our 2009 US survey of recycling behavior. The data are from a Web-based survey administered to the Knowledge Networks panel. The particular sample analyzed is the subsample of bottled water users from a nationally representative sample of households. Based on the resident's state and the time period, variables for state recycling and deposit laws were matched to each respondent.

The empirical analysis permits assessment of the degree to which people gravitate to corner solutions as well as the influence of each of the components of the decision. In particular, our dataset provides information on the number out of every ten plastic water bottles that the household reports recycling. This information is at the individual household level, which is more refined than in previous studies.

Several variables capture the cost components of recycling. We measure the value of time costs, $w$, using the level of household income. Time costs also will be influenced by the amount of time involved and the convenience of recycling. Chief among the potential influences on the time cost is the stringency of state recycling law that is in place. Ranked in order of stringency are the 14 states (plus Washington, DC) that have laws requiring mandatory recycling or provide an opportunity for recycling, the 15 states that require the development of a recycling plan, the 6 states that specify a recycling goal but otherwise do not impose requirements, and the

15 states with no recycling law at all. With more stringent laws, the availability of recycling locations tends to rise, increasing the ease and reducing the time cost of recycling. These laws in turn affect the availability of recycling opportunities, as shown by Bell, Huber, and Viscusi (2010).

State deposit laws affect recycling time costs and the monetary payoff. If there is a deposit law covering plastic water bottles, then there is a payment $p$ per bottle returned. However, even a deposit law that does not cover water bottles might boost recycling rates by leading people to visit a recycling center for their other bottles and cans, thus lowering the fixed time cost component associated with recycling plastic water bottles.

A distinctive aspect of our data is the inclusion of detailed information about the nonpecuniary aspects of the recycling decision that affect the value of $b(e, v, w)$. The warm glow environmental benefit measure of $e$ is captured by the variable for whether the respondent considers himself or herself to be an environmentalist. This variable is more influential than whether the respondent belongs to a national environmental organization, although as shown in Viscusi et al. (forthcoming), that measure, too, has a positive effect on recycling behavior. Overall, 42 percent of respondents describe themselves as being environmentalists.

The social norm attitudes are less prevalent, as 68 percent of the sample express neither a private value nor the perception of an external norm for recycling. The variable we use in the analysis to capture the respondent's private value associated with recycling is a 0-1 dummy variable for whether the respondent would be upset with neighbors if they did not recycle.[1] The share of respondents indicating such a private norm was 28 percent of the sample. The analogous measure of the cost of external norm $c$ is a 0-1 dummy variable for whether the respondent's neighbors would be upset with someone who did not recycle.[2] Only 16 percent of the sample

acknowledged such an external norm, with three-fourths of this group also voicing a private value of recycling behavior. Thus, there is little evidence of concern with external norms in the absence of private values. Higher income levels, which is our measure of the opportunity cost $w$ of recycling, are expected to have a positive effect on $b(e, v, w)$ if there is a positive income elasticity of the demand for environmental quality.

The discontinuous nature of recycling decisions is borne out in the sample distribution of the number of bottles out of ten that people recycle. The percent of nonrecyclers, those who indicated they did not recycle at all, is 6 percent for states with water bottle deposit laws, 17 percent for states with deposit laws that do not cover water bottles, and 35 percent for states with no deposit law. By contrast, the intermediate category of recycling amounts is not sensitive to the recycling regime, which is what we predict based on economic theory. The distribution of respondents in the 1–7 out of 10 bottles category is 12 percent for states without deposit laws, 13 percent for states with deposit laws that do not include plastic water bottles, and 7 percent for states with deposit laws including plastic water bottles. The percentage of respondents who recycle 8–10 out of 10 bottles is 53 percent for states without deposit laws, 69 percent for states with deposit laws that do not include plastic water bottles, and 87 percent for states with plastic water bottle deposits. Thus, the presence of deposit laws does not increase the percentage of recyclers in the intermediate category, but rather shifts the mass of the distribution to the diligent recycler group.

These results are also true more generally. Controlling for state laws and a detailed set of individual and regional characteristics, effective recycling laws and water bottle deposits generate a discontinuous shift in behavior, transforming nonrecyclers into diligent recyclers. The regression estimates in Table 1 permit the analysis of the respective role of private values, social norms, and economic incentives. The

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[1] Our characterization of social norms is different from that of Bente Halvorsen (2008), who considers a cluster of effects relating to norms and attitudes generally. Her variable pertaining to the respondent generally liking "to do what I want others to do" is closer to our characterization of social norms.

[2] The survey asked respondents their opinions about several statements on a five-point scale: strongly disagree, disagree, no opinion, agree, and strongly agree. For whether the respondent would be upset, the text was: "I would be upset if I noticed someone in my neighborhood putting recyclable

materials into the garbage." For whether neighbors would be upset, the text was: "Other people in my neighborhood would be upset if they noticed someone putting recyclable materials into the garbage." For our analysis, the personal and external social norm variables take on a value of one if the respondent agreed or strongly agreed with the statement and zero otherwise.

TABLE 1—REGRESSIONS PREDICTING NUMBER OF PLASTIC WATER BOTTLES RECYCLED

| | Number of bottles recycled out of 10 (OLS) | Number of bottles recycled out of 10 (Tobit) | Ordered probit (8–10, 1–7, 0 bottles out of 10) |
|---|---|---|---|
| Neighbors would be upset if someone put recyclables in garbage | 0.3977 (0.3885) | 1.4005 (1.7130) | 0.2530 (0.1949) |
| Respondent would be upset if neighbors put recyclables in garbage | 1.9946*** (0.3686) | 7.3378*** (1.5020) | 0.7766*** (0.1600) |
| State has deposit law that does not cover water bottles | 1.0582** (0.4891) | 3.6389** (1.7309) | 0.3145* (0.1705) |
| State has deposit law covering water bottles | 2.5100*** (0.3526) | 9.3815*** (1.6626) | 0.9531*** (0.1794) |
| State has mandatory recycling or provides an opportunity to recycle | 2.6753*** (0.4798) | 9.0396*** (1.6309) | 0.8065*** (0.1553) |
| State requires a recycling plan | 1.1786** (0.4843) | 3.1273** (1.5156) | 0.2653* (0.1460) |
| State requires a recycling goal | −0.0469 (1.0861) | −0.6988 (3.3511) | −0.0229 (0.3396) |
| Considers self environmentalist | 1.2092*** (0.3358) | 4.8764*** (1.1723) | 0.4334*** (0.1189) |
| Income/10,000 | 0.0946** (0.0379) | 0.3124** (0.1378) | 0.0421*** (0.0144) |

*Notes:* Robust standard errors in parentheses. The $R^2$ for the OLS equation is 0.2659. Regressions include a highest income category variable and a constant in the OLS and Tobit runs.

   ***Significant at the 1 percent level.
    **Significant at the 5 percent level.
     *Significant at the 10 percent level.

three columns of estimates report OLS and Tobit results for the number recycled out of every 10 bottles used, and ordered probit results for diligent recyclers who recycle 8–10 out of 10 bottles, intermediate recyclers who recycle 1–7 out of 10 bottles, and nonrecyclers who recycle 0 out of 10 bottles. Since the signs and statistical significance of the variables are similar, we focus here on the first column of OLS estimates. Private valuation of the environment as reflected in whether the respondent is a self-described environmentalist boosts recycling by an average of 1.2 out of 10 bottles. The social norm variable reflecting one's potential guilt with respect to neighbors' attitudes if one does not recycle is not statistically significant. By contrast, registering a private value toward recycling boosts returns by 2.0 out of 10 bottles. Thus, the internal private value is critical in promoting recycling, while the external norm is not.

It is important to speculate on why the internal value may be so much more important than the external one. The importance of the private norm is easy to understand. It would be inconsistent if not hypocritical to be upset with neighbors' failure to recycle if one did not recycle oneself. By contrast, the external norm has no such behavioral link. Particularly in today's individualistic climate, it is reasonable for a person to acknowledge that his or her failure to recycle will upset neighbors and still not do it. Ignoring a neighbor's response is particularly reasonable if one's neighbors are unlikely to see the transgression, or if the transgressor gains utility from upsetting those neighbors. In any event, our data are consistent with the conclusion that substantial changes in recycling are unlikely to derive from perceived external pressure. However, the various recycling law variables may capture, in part, reciprocity effects whereby recycling by others influences one's recycling behavior.

Neither private values nor social norms are more influential than the combined effect of the variables that capture the role of economic incentives. Plastic water bottle deposit laws boost recycling amounts by 2.5 out of 10 bottles. States with deposit laws that do not cover water bottles also increase recycling, though by less than half as much as in states where plastic water bottles are included. The most effective

TABLE 2—PROBIT REGRESSIONS PREDICTING SOCIAL NORMS OF RECYCLING

| | Respondent would be upset if neighbors put recyclables in garbage | Respondent would be upset if neighbors put recyclables in garbage | Neighbors would be upset if someone put recyclables in garbage | Neighbors would be upset if someone put recyclables in garbage |
|---|---|---|---|---|
| State has deposit law that does not cover water bottles | 0.0637 (0.0599) | −0.0083 (0.0656) | −0.0062 (0.0462) | −0.0571 (0.0410) |
| State has deposit law covering water bottles | 0.1213** (0.0541) | 0.0724 (0.0704) | 0.1217*** (0.0462) | 0.0693 (0.0558) |
| State has mandatory recycling or provides an opportunity to recycle | 0.1503** (0.0627) | 0.1139* (0.0652) | 0.0624 (0.0513) | 0.0229 (0.0500) |
| State requires a recycling plan | 0.0262 (0.0577) | 0.0303 (0.0594) | 0.0045 (0.0470) | 0.0201 (0.0477) |
| State requires a recycling goal | −0.0611 (0.1124) | −0.0729 (0.1063) | 0.0288 (0.1110) | −0.0041 (0.0925) |
| Considers self environmentalist | 0.3050*** (0.0375) | 0.3088*** (0.0376) | 0.0939*** (0.0305) | 0.0972*** (0.0303) |
| Income/10,000 | 0.0152*** (0.0047) | 0.0159*** (0.0047) | 0.0069* (0.0036) | 0.0068* (0.0036) |
| Regional variables | No | Yes | No | Yes |

*Notes:* Coefficients have been transformed to equal marginal effects. Robust standard errors in parentheses. Regressions include a high income category variable. The regional variables are for three census regions and whether the respondent lives in an SMSA.

\*\*\*Significant at the 1 percent level.

\*\*Significant at the 5 percent level.

\*Significant at the 10 percent level.

recycling laws require mandatory recycling or an opportunity to recycle, followed by those requiring a recycling plan. These laws boost recycling rates with effects as high as 2.7 bottles out of 10 for the most stringent laws.

In terms of demographics, higher income levels boost recycling rates. Although the opportunity costs of recycling rise with income, which should decrease recycling rates, the observed positive influence of income indicates that there is a positive income elasticity of demand for the environment that offsets the role of income in raising the opportunity costs of recycling. The net result is that there is a slight increase in recycling at higher income levels. Income levels also have an interactive effect as they affect the relative attractiveness of different recycling modes. Viscusi et al. (forthcoming) find that bottle deposits are less influential in boosting recycling rates at higher income levels, and Bevin Ashenmiller (2009, 2010) finds that bottle deposits are a significant income source for the poor.

Based on these results it is possible to calculate the monetary equivalent of private values and perceived social norms. Plastic water bottle deposits are 5 cents per bottle. Based on the effect of the variables relative to that of the plastic water bottle deposits variable, the warm glow benefit of recycling has an economic value of about 2.5 cents per bottle, and private values that reflect becoming upset at others' failure to recycle have a value of about 4 cents per bottle.

To determine whether the norms variables themselves are affected by the laws and regulations, Table 2 reports probit estimates of the determinants of whether the respondent would be upset if neighbors didn't recycle, as well as whether the respondent believes neighbors would be upset if people did not recycle. The first pair of regressions does not include regional characteristic variables. So, excluding these influences, residents of states with plastic water bottle deposit laws do express greater concern with both the personal value for virtue and the perceived external social norm for green guilt. There is also a positive effect on the internal social norms of the most stringent recycling law variable, which pertains to states

that have mandatory recycling or provide the opportunity to recycle. That the most stringent bottle deposit variable and the most stringent recycling law variable influence social norms, but the less stringent ones do not, is consistent with the external perceptions of norms being influenced by policies that establish standards of behavior. However, the inclusion of a set of four broad regional variables in the final pair of regressions in Table 2 makes the policy effects insignificant, with the exception of the positive effect of mandatory recycling laws on personal norms. Thus, the influence of laws and deposit policies appears to be due largely to broad regional effects.

In contrast, the effect of private values remains strongly influential, even after including the regional variables. People who consider themselves to be environmentalists have a 0.31 higher probability of expressing a personal norm and a 0.10 higher probability of expressing an external social norm. Higher income levels, likewise, have a statistically significant positive effect in each instance, with the point estimate of the effect of income being more than twice as great for personal norms as compared to external social norms. In conjunction with the relatively greater effect of personal norms than external norms on recycling behavior shown in Table 1, the nonpecuniary determinants of the recycling decision are personal beliefs and attitudes as well as personal norms, which in turn are influenced by private values.

Although private values and social norms matter, the policy levers that can be manipulated—bottle deposits and recycling laws—potentially have a powerful effect on recycling rates. Because of the discontinuous nature of the recycling decision, the results of these policies are often dramatic, as they transform individual households from nonrecyclers to diligent recyclers. However, individual attitudes with respect to both the environment and actions that others should take are influential as well. Perceptions of how others will perceive a household's environmental behaviors matter less.

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