

Compensating for Public Harms: Why Public Goods Are Preferred to Money

Carol Mansfield, George L. Van Houtven, and Joel Huber

ABSTRACT. *This paper provides evidence that public goods represent a more acceptable response to public harms than monetary compensation. We demonstrate a preference for public goods over monetary compensation, in part because receipt of public goods may limit the sense of guilt or bribery from accepting compensation for the injury. More surprising, this preference for public goods over money in the presence of a harm remains in a free-market choice where guilt is not an issue. It appears that public goods psychologically mitigate or balance public harms in a way that makes them more valuable in the presence of public harms. (JEL Q2)*

I. INTRODUCTION

One of the major paradoxes arising out of the literature examining proper compensation to communities or individuals is money's apparent inability to adequately compensate individuals for losses, especially when those losses relate to the environment, health, or safety. Experience has shown that asking people how much money they are willing to accept as compensation for a loss of utility can be problematic, and that cash compensation is often ineffective in winning public support for projects such as the siting of noxious or nuisance facilities. This issue complicates attempts to establish an appropriate measure of compensation for losses in public welfare, either from natural resource damages or the siting of locally undesirable facilities. It also has practical implications for the facility-siting process and other situations in which the public should be compensated.

In this paper, we examine whether and how the rate at which individuals implicitly trade off monetary gains (i.e., "cash") and public goods depends on the context of the

choice. We hypothesize that, when siting a public harm is at issue, many individuals will find public goods¹ to be a more attractive and acceptable form of compensation than cash. We discuss a number of forces driving this hypothesis, including factors such as the bribery effect, the crowding out of public-spirited altruism, and feelings of moral responsibility to explain respondents' adverse reactions to offers of cash compensation. By contrast, public goods may not evoke the same negative perceptions because they contribute to the community's general welfare. In addition, we propose that even in the absence of issues related to guilt and bribery, public goods may be viewed as a way to effectively mitigate the psychic harms associated with local public harms.

We conducted a survey in which respondents were confronted with a variety of scenarios and offered either cash compensation or compensation in the form of various public goods. This compensation was offered in return for accepting something moderately undesirable (a public harm), such as a noisy

Dr. Mansfield and Dr. Van Houtven are senior economists at Research Triangle Institute in North Carolina, and Dr. Huber is a professor at the Fuqua School of Business, Duke University. The authors would like to thank two anonymous reviewers for their very helpful suggestions and Andrew Biehl and Mark Boone for their excellent research assistance. This research has been supported by a grant from the U.S. EPA's Science to Achieve Results (STAR) program. The research has not been subject to EPA review and therefore does not necessarily reflect the views of the Agency.

¹ In this paper, we refer to "public goods"; however, it would be more accurate to say "publicly provided goods." Most of the goods to which we refer are not pure public goods, but neither are they private goods. They are, however, provided to a community by the government or a company. Examples include parks, community recreation centers, and trees and wildflowers planted on the side of the road. See Table 3 for a list of the public goods offered as compensation in the experiment.

road or a livestock farm close to the respondents' property. We deliberately limited the public harms tested to be those that are moderately undesirable—unpleasant, unsightly, or smelly, but not unhealthy or dangerous to those in the local area. Similarly, the public goods tested provide a moderate benefit both to the person and the local community (like a walking trail or a fence that shields noise). Both costs and benefits were designed to avoid protected values (Baron and Spranca 1997) or devastating losses (Tversky and Kahneman 1991). Facilities that are perceived to be very dangerous to health or safety are more likely to elicit alarmist responses or total rejection of the scenario, which would make it difficult to evaluate the hypotheses posed in this research. However, this is not meant to imply that dangerous health and safety trade-offs are unimportant. Indeed, showing distortions from a normative model with the moderate disamenities described in this experiment supports the need for more research into extreme trade-offs.

In addition to questions exploring willingness to accept (WTA) compensation for a public harm, we explore the decision between the same outcomes framed as a neutral market choice. In the neutral market choice, the respondent chooses between two houses that differ in the level of property taxes and types of public goods available in the neighborhood. We present evidence that the value of the public goods increases relative to cash as respondents shift from a neutral market framework to a compensation framework—the predicted proportion of respondents choosing cash over the public good in the compensation questions is lower than the actual percentage who chose cash over the public good in the neutral market setting. However, even within the neutral market setting, the presence of a public harm is seen to increase the value of the public good relative to cash.

The paper is organized as follows. In Section II, we discuss the intuition behind our hypotheses. Section 3 contains a description of the hypotheses and the survey. Section 4 presents the results, and Section 5 provides a discussion of the results. Finally, in Section 6

we discuss the policy applications of this work and future directions for this research.

II. INTUITION

Why Would Individuals Be Averse to Cash Compensation?

The hypothesis that individuals will prefer public good compensation to cash when a public harm is introduced into their community draws together a number of studies. Economists typically assume that monetary payments will restore losses in utility and generally express measures of welfare change (such as compensating and equivalent variation) in monetary terms. However, in both real-world situations and surveys, designing acceptable compensation packages for individuals facing a loss in utility has proved difficult. Frey, Oberholzer-Gee, and Eichenberger (1996) review the literature on siting noxious facilities and find no cases in which cash payments to individuals have been used successfully as a tool to win local support for a facility. Frey, Oberholzer-Gee, and Eichenberger (1996), Frey and Oberholzer-Gee (1997), and Kunreuther and Easterling (1990, 1996) give examples of cases in which monetary compensation had a negative impact on support, with support for siting hazardous waste storage facilities and other noxious facilities actually falling or remaining unchanged in response to offers of cash compensation. When asked in surveys, individuals demand what seem like excessively large amounts of cash compensation (see Fisher, McClelland, and Schulze [1988] or Brown and Gregory [1999]) for a summary of a number of studies that compared WTA compensation with willingness-to-pay [WTP]).

The literature has identified a number of negative psychological reactions to cash compensation that take two related forms. First, the cash payments may carry the stigma of a bribe designed to corrupt human nature. O'Hare, Bacow, and Sanderson (1983) discuss compensation's role in siting and find evidence from case studies that it is often viewed as a bribe. As discussed in

Calabresi and Bobbitt (1978), this finding is especially true if people think it is morally or ethically inappropriate to discuss trade-offs between risks to health, safety, or the environment and cash payments. In a related literature, Moffitt (1993) and Keane (1995) identify what they call a welfare stigma effect to explain why some individuals refuse welfare payments for which they qualify. The authors hypothesize that the act of receiving cash payments brings disutility for some potential welfare recipients. The same hypothesis can be applied to cash compensation for public harms.

Second, the payments may diminish what Frey and Oberholzer-Gee (1997) call the intrinsic motivation of civic duty, or altruism toward the community, that inspires people to support projects that serve a greater public good but impose local costs on the host community (see also Frey 1997).² Using survey data from a community facing the siting of a low-level nuclear waste facility, Frey, Oberholzer-Gee, and Eichenberger (1996) and Frey and Oberholzer-Gee (1997) demonstrate that cash compensation may "crowd out" intrinsic motivation for supporting the siting of the facility. Boyce et al. (1992) present experimental evidence suggesting that accepting compensation imposes a higher level of moral responsibility on the individual than indicating a WTP to prevent a harm from occurring. Subjects in their experiment were either given a houseplant and asked if they would like to sell it back (measuring WTA values) or asked if they would like to purchase the plant (measuring WTP values). In addition, half of the respondents were told the plants would be destroyed if the participants sold the plant back or decided not to buy it, while the other participants were not given any information about the fate of the plants. Although the WTP values were not statistically different between the two sets of respondents, the WTA values of the group who were told that the plant would be destroyed if they sold it back to the researchers were significantly higher than the WTA values of the group who were not told the fate of the plants. The WTA compensation framework, which links the individual to any negative consequences of his or her decision, had

a different effect on the participants in the experiment than the WTP framework.

Why Would Individuals Prefer Public Goods as Compensation?

Public goods provide a number of benefits that may counteract the negative feelings engendered by cash compensation. On the surface, an offer of cash compensation to the entire community is no different than providing a public good for the whole community—the whole community benefits in each case. However, public goods may be *perceived* as a fairer method of compensation. Schools and parks are usually not thought of as "bribes" in the same way as cash payments. Numerous case studies suggest that people prefer "in-kind" compensation, and this type of compensation has been used in some successful facility sitings (O'Hare, Bacow, and Sanderson 1983; Portney 1985). As Frey, Oberholzer-Gee, and Eichenberger (1996) note, "In-kind compensation for socially beneficial projects (schools or fire stations) makes it easier to link the monetary rewards with positive values" (1308). If an individual supports compensation in the form of a public good, he/she demonstrates interest in the community as a whole and receives utility from public-spirited altruism. People might also feel that the moral responsibility for the negative outcomes of the public harm implied by the compensation framework would be spread throughout the community when the compensation is a public good, thereby easing the burden on a particular individual. These factors may increase the chance that an individual will accept the public good compensation because it reduces the guilt associated with the compensation and

² The public-spirited altruism that motivates individuals to support the siting of the low-level nuclear waste facility in Frey, Oberholzer-Gee, and Eichenberger (1996) and Frey and Oberholzer-Gee (1997) is similar to the notion of "impure" altruism popularized by Andreoni (1990). Impure altruists receive utility from the act of donating to a public good beyond the utility they receive from the public good itself. In our study, this motive is less salient because some of the harms in our survey are not the kinds that one necessarily feels obligated to accept as a good citizen.

restores the intrinsic motivations of civic duty and public spiritedness.

Furthermore, individuals may find it easier to think in terms of a public good/public harm trade-off because they share the "publicness" of the goods. In much the same way that Viscusi, Magat, and Huber (1991) and Krupnick and Cropper (1992) found that individuals were more willing to make risk/risk than risk/dollar trade-offs, individuals may also find public goods to be a more relevant and comparable trade-off to a public harm than cash.

In addition to the greater appeal of public goods to compensate for public harms, public goods might directly mitigate the specific detriments caused by the public harm. For example, the presence of a hazardous waste facility in a community may increase the utility of fire and rescue squad services. However, we believe that the appeal of public goods as compensation goes beyond their ability to "fix" the physical problems associated with the public harms. Public goods might also more effectively mitigate the less tangible problems associated with siting public harms, such as neighborhood image and fears of declining property values—the psychic costs of living near a public harm.

To isolate the psychological from functional mitigation, this study examines public goods that are unrelated to any of the physical threats posed by the public harms. For example, in the Airport Scenario, a park is offered as compensation for the noise of airplanes flying overhead (the scenarios are discussed below). Rather than becoming more valuable, the direct value of a park is less due to airplane noise. In the Compost Center Scenario, the community will get landscaping on their streets and medians in exchange for allowing a compost center for yard waste to be built in their neighborhood. Thus, we focus on the public good's psychological benefit rather than direct mitigation of negative consequences that occur when a community plays host to a public harm.

III. HYPOTHESES

Does the presence of public harms in a neighborhood change the marginal rate of

substitution between public goods and cash? If so, does the amount of change depend on the context of the choice (whether the choice is an offer of compensation or a neutral market choice)?

To begin answering these questions, assume that the individual's utility function (U) contains three goods: cash (c), public goods (g), and public harms (h). When the individual is asked about his/her WTA cash (or a public good) for the siting of the public harm, he/she will evaluate the change in utility (ΔU) between the status quo and the siting/compensation offer.

For cash compensation,

$$\Delta U[(c_0, g_0, 0), (c_1, g_0, h)] = \Phi_c * U(c_1, g_0, h) - U(c_0, g_0, 0). \quad [1]$$

For public good compensation,

$$\Delta U[(c_0, g_0, 0), (c_0, g_1, h)] = \Phi_g * U(c_0, g_1, h) - U(c_0, g_0, 0). \quad [2]$$

In these expressions, c_0 and g_0 are the initial levels of cash and public goods available to the individual, c_1 and g_1 are the amount of cash and the specific public good offered as compensation, h is the public harm ($h = 0$ when no public harm is present in the neighborhood), and $c_1 > c_0$, $g_1 > g_0$, and $h \geq 0$. The variables Φ_c and Φ_g ($0 < \Phi_c, \Phi_g \leq 1$) represent the factors described in Section 2 (i.e., guilt, bribery-related, or "crowding out" effects) that might lead individuals to react negatively to cash and public goods compensation, respectively. That is, the act of accepting compensation has a negative effect on the individual's gain in utility. This formulation is similar to the one used by Frey, Oberholzer-Gee, and Eichenberger (1996). They argue that when cash is offered as compensation for siting a public harm, any potential utility gains (e.g., from "public spiritedness") are reduced ("crowded out") by some factor (which we call Φ_c). The multiplicative form in which guilt (Φ_c, Φ_g) enters equations [1] and [2] implies that guilt lowers utility in proportional terms (i.e., the negative effects of compensation on utility increase with the size of the compensation).

If the guilt effect enters additively, as in Frey, Oberholzer-Gee, and Eichenberger (1996), our hypotheses still hold under most assumptions. Our data allow us to test the general hypotheses implied by these equations but not the exact form of the individual's utility function.

These factors should not come into play when an individual is asked to make a neutral market choice, such as a choice between houses in two neighborhoods where one has relatively higher property taxes (i.e., less cash) and relatively more of a public good. The act of choosing one house over another should not engender any sense of guilt, bribery, or "crowding out," because the public goods (and any public harms) already exist in the neighborhoods. In this case, the individual evaluates the difference in utility (ΔU) between the two neighborhoods:

$$\Delta U[(c_0, g_1, h), (c_1, g_0, h)] = U(c_0, g_1, h) - U(c_1, g_0, h).^3 \quad [3]$$

We can compare the *relative* preference for public goods and cash under the compensation and market choice frameworks through the following expression:

$$\frac{\Phi_g^* U(c_0, g_1, h)}{\Phi_c^* U(c_1, g_0, h)} \geq \frac{U(c_0, g_1, h)}{U(c_1, g_0, h)} \quad [4]$$

The term on the left-hand side of equation [4] represents the relative preference for public goods and cash in a compensation framework, and the term on the right-hand side is a similar indicator for a neutral market choice setting. This equation provides a framework for our first hypothesis.

Hypothesis 1: *Preferences for public goods over cash are stronger when offered as compensation for a public harm than in a neutral market choice between public goods and cash.*

If the guilt, bribery, or crowding out effect of cash is stronger than for public goods or if the "in-kind" nature of the public good makes it more attractive as compensation than cash, then we expect $\Phi_g > \Phi_c$. This expectation implies that the preference for a public good relative to cash in the compensa-

tion framework should be greater than in a neutral market choice setting (i.e., that the left-hand side of equation [4] is greater than the right-hand side).

To test Hypothesis 1, we use the results from three types of questions, shown in Appendix A. The first is a siting proposal that offers monetary compensation to residents (WTA cash) and the second offers a public good as compensation (WTA public good). The results from these two questions are then compared to the results from a third type of question—a neutral market choice question that offers the choice between a house with lower property taxes and a house located near a public good when public harms are also located in the neighborhoods. As discussed in more detail below, we use the responses to the two WTA questions to predict the percentage of individuals who would choose cash over the public good if given a direct choice. The predicted percentages are then compared to the actual percentage who chose cash in the corresponding neutral market choice questions using a sign test. We show that the predicted and actual percentages differ in a systematic way consistent with a greater value for public goods over cash for compensation.

Hypothesis 1 is not the end of the story. In a neutral market choice between two houses, the respondent is "moving" into a neighborhood where the levels of property taxes, public goods, and public harms have been fixed before the respondent's "arrival." Neither the public good nor the cash is offered as compensation for anything. In this situation, there should be no intrinsic motivation for preferring cash to public goods, nor should guilt be associated with the price incentive.

However, what if the marginal utility of the public good increases in the presence of the public harm? The public good would have a supplemental mitigating effect that it would not have if the public harm did not exist. For example, a community center might have a stronger positive effect on a neighborhood's reputation if this reputation were

³ In this case, it is assumed that both neighborhoods have the same public harm present.

damaged by the presence of a public harm. Residents of communities with both public goods and public harms might place more value on their public goods than residents of neighborhoods with no public harms. If the presence of the public good more clearly balances the effects of the public harm on the neighborhood than cash, then the utility of the public good will be higher in the presence of a public harm than the utility from cash payments.

The right-hand side of equation [4] represents the relative utility between living in a neighborhood with a public good and a public harm or with more cash and a public harm. If there is a positive interaction between the public good and the public harm, then the value of the public good versus the extra cash will be higher if a public harm is also present in the neighborhood. Stated more formally, this would imply the following:

$$\frac{U(c_0, g_1, h)}{U(c_1, g_0, h)} > \frac{U(c_0, g_1, 0)}{U(c_1, g_0, 0)} \quad [5]$$

Equation [5] provides the basis for Hypothesis 2.

Hypothesis 2: *Preferences for public goods over cash increase with the presence of public harms in a neighborhood.*

The survey contains two versions of the market choice question—one that describes public harms that are located near both houses and one that does not. To test whether responses to the market choice questions are sensitive to including a description of a nearby public harm, we compare the percentage of respondents who choose cash in the two types of market choice questions separately for the different scenarios. In addition, we pool the responses across different scenarios and use regression analysis to test for the significance of a dummy variable indicating that the market choice question contained a description of the nearby public harm.

Putting Hypotheses 1 and 2 together, equations [4] and [5] yield the following:

$$\Phi g^* U(c_0, g_1, h) > \frac{U(c_0, g_1, h)}{U(c_1, g_0, h)} > \frac{U(c_0, g_1, 0)}{U(c_1, g_0, 0)} \quad [6]$$

If both Hypothesis (1) and Hypothesis (2) hold, preferences for public goods over cash should be highest in the WTA compensation framework where both the guilt factor and the additional marginal utility from a public good in the presence of a public harm hold. Without the guilt factor, preferences for public goods are still higher in neighborhoods with public harms if Hypothesis 2 holds.

Sample and Survey Descriptions

To test these hypotheses, we designed a variety of scenarios and choice question formats for our surveys. Table 1 summarizes the four choice question frameworks (WTA cash, WTA public good, market choice with a public harm in the neighborhood, and market choice without a public harm in the neighborhood). Examples of the text of different questions are presented in Appendix A.⁴ We administered the surveys to three sets of respondents with different characteristics to validate our findings across different contexts. Although the three surveys differ in terms of the number of questions asked and the specific scenarios included, each survey started with attitude questions, followed those with choice questions, and finished with demographic questions.

The first survey (Church) was conducted through local churches in the fall of 1996. The churches distributed the surveys to parishioners with pre-addressed, postage-paid envelopes for return. A total of 160 surveys were collected.⁵ Each respondent made one choice per scenario, answering a total of eight choice questions.⁶ The scenarios were

⁴ The full text of the survey is available from the authors.

⁵ The response rate for this survey could not be estimated because it is not known how many were distributed.

⁶ Each respondent answered either a WTA cash question, a WTA public good question, or a market choice (with a public harm in the neighborhood) question for each scenario. With eight scenarios and three types of questions, there were 24 possible questions. The questions were used to create six versions of the survey each with eight questions. Only three of the eight scenarios on the Church survey were relevant to this study.

TABLE 1
CHOICE QUESTIONS

Question	Description	Action
WTA cash	An offer of cash compensation in exchange for the siting of a public harm in your neighborhood	Vote yes or no
WTA public good	An offer of public good compensation in exchange for the siting of a public harm in your neighborhood	Vote yes or no
Market choice with public harm	Choice between house with lower property taxes and house located near public good (identical public harms located near each house are described in scenario)	Choose house A or house B
Market choice with no public harm	Choice between house with lower property taxes and house located near public good (no mention of nearby public harm)	Choose house A or house B

Note: See Appendix A for examples of each question type.

presented in the same order in each survey, but the type of choice the respondent was asked to make for each scenario varied across surveys.⁷ All the market choice questions asked in the church survey included a description of identical public harms located near both houses.

The second survey (Computer 1) was a self-administered computer survey using a mall-intercept format conducted in the summer of 1997 (see Mansfield, Van Houtven, and Huber [2001]) Table 2 for a comparison of the demographics of our mall-intercept samples with the demographics of the county in which the mall was located).⁸ A market research firm in a mall in Greensboro, North Carolina, collected 202 responses. As with the church survey, each respondent answered only one question per scenario, answering a total of eight choice questions.⁹ Again, the scenarios were presented in the same order, but the type of choice the respondent was asked to make for a particular scenario varied across surveys (similar to the Church survey, see footnote 7). Also, the market choice questions all included a description of the public harm. Respondents had to be over 20 years of age and own or rent their own home or apartment to participate in the survey.

The final survey (Computer 2) was also a

self-administered computer survey using a mall-intercept format conducted in the fall of 1997. This survey was administered simultaneously at five different malls in Florida, North Carolina, New York, and New Jersey, for a total of 265 responses (approximately 50 from each mall). We selected malls with high-income demographics to contrast with the Greensboro mall. There were eight choice questions for each respondent, but in this survey each respondent saw six different scenarios and answered two questions for two of the scenarios.¹⁰ Specifically, for two of the scenarios on each survey, the respondent answered both a market choice question

⁷ For example, the airport scenario was the third scenario on each survey. One-third of the respondents answered a question about their willingness to accept cash, one-third answered a question about their willingness to accept a public good, and one-third answered a market choice question about two houses located next to airports.

⁸ Several studies have found that in some circumstances, mall intercept surveys yield samples that are similar to telephone surveys. See Boyle et al. (1996), footnote 9.

⁹ With eight scenarios and three question formats there were 24 possible questions. Three versions of the survey were created from the 24 questions, each one containing eight choice questions. Four of the eight scenarios were relevant to this study.

¹⁰ Seven of the scenarios were relevant to this study.

TABLE 2
VARIABLES, MEANS, AND (STANDARD DEVIATIONS)

Variable	Church	Computer 1	Computer 2	Description
<i>Survey Variables</i>				
Market dummy				Dummy variable = 1 if market choice question; = 0 otherwise
Cash dummy				Dummy variable = 1 if WTA cash question, = 0 otherwise
Public harm			F	= 1 if choice of compensation question or market choice question that included a description of public harm common to both houses
Cash amount		\$666.67 (305.59) min \$200 max \$1,200	\$625.00 (222.26) min \$400 max \$1,000	Dollar amount of cash offer
Duration	na	14.37 (10.50)	12.21 (18.81)	Time spent on survey in minutes
Airport				Dummy variable for airport scenario
Waste-to-energy				Dummy variable for waste-to-energy plant scenario
Livestock farm				Dummy variable for livestock farm scenario
Recycling Transfer center				Dummy variable for recycling transfer center scenario
Radio tower				Dummy variable for radio tower scenario
Landfill				Dummy variable for landfill wall scenario
Compost center				Dummy variable for yard waste compost center scenario
<i>Demographic Characteristics</i>				
Vote	94%	60%	76%	Vote = 1 if voted in last presidential election
Own Home	84%	69%	58%	Dummy variable = 1 if own home, = 0 if rent
Years	37.61 (24.46)	32.23 (15.50)	19.45 (14.45)	Years lived in state, mean value of category used for each category
Income	\$53,901 (\$24,925)	\$39,783 (\$22,726)	\$41,796 (\$23,761)	Income, mean value of category used for each category, \$90,000 for top category
Male	37%	39%	52%	= 1 if male
Married	74%	55%	51%	= 1 if married
White	94%	69%	77%	= 1 if white
African American	3%	26%	11%	= 1 if African American
Age	56.89 (16.35)	42.12 (12.89)	37.63 (12.46)	Age, mean age of category used for each category
Retired	42%	8%	9%	= 1 if retired
Work	47%	76%	71%	= 1 if work full or part time
Beyondhs	86%	56%	78%	= 1 if education beyond high school grade

TABLE 3
SCENARIOS FOR CHOICE QUESTIONS

Scenario	Scenario Description	Disamenity	Cash Compensation	Public Good Compensation	Number of Respondents			
					WTA Cash	WTA Public Good	Market Choice	Survey ^a
WTA Cash versus WTA Public Goods								
Landfill	Landfill next to your house is expanding to occupy the rest of the land owned by the landfill company. Landfill has been well managed, with no problems with odor, is not visible from your house, and machinery cannot be heard from your house. Original negotiations call for company to build an attractive wall between adjacent houses and new part of landfill to reduce noise level to level of noise from a typical street.	Without the wall between your house and new part of landfill, there will be noise from equipment between 9a.m.-5p.m. on some weekdays. Noise equivalent to a small construction site. You still will not be able to see the landfill from your house.	\$1,200 (CH, C1), \$600 (C2)	Five-mile paved trail across the street from your house. Currently there are no sidewalks along the road.	62 64 65	55 66 65	56 68 130 (73) (57)	CH C1 C2 (with harm) ^b (without harm) ^c
Livestock farm	You live in a predominantly rural area, although you and most of your neighbors do not farm, there are several farms around you that grow corn. One of these farms wants to raise livestock on a contract for a large company instead of growing corn.	Because of the direction the wind usually blows, there will be little or no odor most of the year. However, between 5-1.5 days each year, odor will be strong enough to make it unpleasant to be outside.	\$1,000	Community center with indoor basketball court, small weight room, and rooms that local groups can use for meeting rooms and classes.	56 66 64	62 68 65	55 64 129 (75) (54)	CH C1 C2 (with PB) (without PB)
Airport	Airport wants to build new runway. Planes will now take off and land over your town. Flights every 30 min. between 8a.m.-5p.m., 7 days a week.	Noise will last 1 minute for each flight, loud enough to interfere with telephone and TV.	\$500	Park with playground, fields for softball and soccer, 2-mile jogging/biking trail	56 68 61	62 64 64	55 66 125 (61) (64)	CH C1 C2 (with PB) (without PB)

Radio tower	Cellular phone company wants to build 300-foot relay tower in undeveloped field next to your house.	Aesthetic. Tower is taller than trees and can be seen from your house and most parts of neighborhood.	\$600 (C1), \$400 (C2)	Artificial lake for boats and swimming	68 65	64 61	66 126 (59) (67)	C1 C2 (with PB) (without PB)
<i>Market Choice Scenarios</i>								
Waste-to-energy plant	State government is building a waste-to-energy plant 2 miles from your house to burn household garbage to generate electricity. No burning of hazardous waste; pollution prevention equipment so only small impact on air pollution.	Truck traffic through the neighborhood and slight odor from building used to store garbage.	\$1,000	New, public library with computers and daytime programs for adults and children	129 (68) (61)			C2 (with PB) (without PB)
Recycling transfer station	County government is building a recycling transfer station 0.5 mile from your neighborhood to store recycled glass, plastic, and newspaper collected from neighborhood until shipped to company that buys recycled goods.	Truck traffic and some noise in the afternoon when recyclables are dropped off and picked up.	\$500	Community center with a swimming pool, walking and biking trails, tennis courts, and fields for softball and other sports.	126 (59) (67)			C2 (with PB) (without PB)
Compost center	County government is building a 25-acre compost center for yard waste (grass clippings, tree branches, etc.).	Increase in truck traffic weekdays from 9 a.m. – 5 p.m.. Some noise from heavy machinery used to move compost. Odor from compost on about 30 days per year. Some people like the smell; others do not.	\$500	Trees and wildflowers on the sides of streets and medians maintained by forestry department of university in city.	126 (66) (60)			C2 (with PB) (without PB)

* Whether question was included in the Church survey (CH), Computer 1 survey (C1), or Computer 2 survey (C2).

** Number of respondents who answered market choice questions that included a description of a nearby public harm.

† Number of respondents who answered market choice questions that did not include a description of a nearby public harm.

and a question about their willingness to accept compensation. This was done to provide more information on how answers correlated between contexts. The two questions were separated in the survey to limit any carry-over. Because one was the market choice and one was a WTA compensation question, we felt that these questions were different enough that answering one would not bias the answer to the next.

As mentioned above, this survey also contained two versions of the market choice question—one in which the description of the two houses included a description of an identical public harm located near the two houses and one that did not. These two versions were randomized across surveys but not within a survey. Thus, for each respondent, either all the market choice questions included a description of the public harm or none did. Furthermore, the order of the questions varied across respondents.¹¹ As in the Computer 1 survey, respondents had to be over 20 years of age and own or rent their residence to participate.

Table 2 contains summary statistics for the three samples. The Church sample contains a larger percentage of Caucasians, homeowners, and retirees and is older and wealthier. Comparing the two Computer samples, Computer 2 respondents are wealthier, younger, and more educated. The Computer 1 sample has a higher percentage of African American respondents than Computer 2, while Computer 2 has a higher percentage of Asian and Hispanic respondents.

Table 3 lists the main features of the seven choice scenarios used for the analysis, including a brief description of the scenarios and the nature of the disamenity from the public harm, the amount of cash and the specific public good, and the number of respondents who answered each type of question for each scenario. The amount of the cash offer and the specific public good offered did not vary within a survey for each scenario. For example, looking at the first row in Table 3, the cash offer was \$1,200 in the Church survey landfill scenario and the public good was a 5-mile paved trail for all respondents in both the WTA and market choice questions.

IV. RESULTS

Hypothesis 1

To test Hypothesis 1, we compare the results from the WTA cash and WTA public good questions with responses to a neutral market choice question that offers the choice between a house with lower property taxes and one located near a public good in the presence of public harms located in the neighborhood. Table 4 presents the results from four scenarios in which we asked WTA cash and WTA public good questions (the first four scenarios listed in Table 3).¹² Column (2) reports the percentage of respondents who were willing to accept the cash compensation in exchange for allowing the nuisance facility to be sited in their neighborhood. Column (3) reports a similar percentage of respondents who were willing to accept a public good as compensation. In the Church and Computer 2 samples, a higher or equal percentage of respondents were willing to accept the public good than the cash (column [2] < column [3]). The reverse is true in the Computer 1 sample. Column (5) in Table 4 reports the percentage of respondents who chose the house with lower property taxes (the cash) over the house near a public good in the neutral market choice question when the question included a description of identical public harms common to both houses. In all cases except three, 50% or more of the sample chose the cash over the public good in the neutral market choice question.

To test Hypothesis 1, it is tempting to compare column (2) with column (3). However, what is important here for testing our

¹¹ The order of the questions was not random. Instead, we took the eight scenarios and four question formats and created four versions of the survey. Each version contained six scenarios and eight choice questions based on the six scenarios. The questions in these four surveys were then presented in two different orders, for a total of eight different surveys.

¹² Recall that respondents in the Church and Computer 1 surveys for a particular scenario answered either a WTA cash question, a WTA public good question, or a market choice question. In the Computer 2 survey, respondents answered both a WTA question (either cash or public good) and a market choice question.

TABLE 4
ACCEPTANCE RATES FOR WTA QUESTIONS VS. MARKET CHOICE QUESTIONS

Scenario (Sample)	Compensation			Neutral Market Choice
	(2) Percentage WTA Cash ^a	(3) Percentage WTA Public Good ^b	(4) Probability Cash > PG Predicted Percentage Choosing Cash ^c	(5) Probability Cash > PG Percentage Choosing Cash in Market Choice with Public Harm ^d
Landfill (Church)	13	19	39	60
Landfill (Computer 1)	52	38	64	87
Landfill (Computer 2)	35	35	50	52
Livestock farm (Church)	20	28	39	50
Livestock farm (Computer 1)	61	51	60	75
Livestock farm (Computer 2)	52	54	48	64
Airport (Church)	15	24	36	44
Airport (Computer 1)	56	45	61	61
Airport (Computer 2)	28	44	33	40
Radio tower (Computer 1)	71	64	58	70
Radio tower (Computer 2)	38	41	47	54

Note: Sample size for each scenario and survey by question type presented in Table 3.

^a Percentage of respondents who answered "yes" (i.e., they would be willing to accept the cash payment to allow the public harm to be sited in their neighborhood).

^b Percentage of respondents who answered "yes" (i.e., they would be willing to accept the public good to allow the public harm to be sited in their neighborhood).

^c Expected proportion who will choose cash over public good based on the WTA responses = $\$H_{cash} / (\$H_{cash} + PG/H_{cash})$ where $\$H_{cash} = (2)/[1 - (2)]$ and $PG/H_{cash} = (3)/[1 - (3)]$, where (2) is the percentage in column (2) divided by 100, etc.

^d Actual percentage who chose cash (the house with lower property taxes) over the public good (the house located near a public good) when market choice question contained a description of nearby public harms in the neighborhood.

hypothesis is *not* the difference in the percentage accepting the harm in exchange for cash or the public good (see Mansfield, Van Houtven, and Huber [2001] for a detailed analysis of the socioeconomic characteristics that influenced the WTA responses).¹³ Rather, we are interested in how the difference in response rates between the WTA questions relates to the trade-off between the public good and the cash in the market choice context.

How can we use the information in columns (2), (3), and (5) to determine whether the value of the public good relative to cash changed as we moved from a compensation to a market setting? Looking at equation [4], we do not observe the levels of utility associated with each choice; we only observe the yes/no choice the individual made. We use the results from the WTA and market choice questions to predict the probability that the sample will prefer public goods to cash in a compensation framework and in a market choice framework. We then test whether the probability that the sample prefers

cash to public goods is higher in the market choice questions than in the compensation framework.

We can use a simple choice model, the Luce model, to predict the results of a choice between cash and the public good in the compensation framework using the results in columns (2) and (3). If the Luce model holds, then the probability of choosing an item in a set is its utility divided by the sum of the util-

¹³ In most cases, the difference between the percentages in columns (1) and (2) is not statistically significant using a z-test for the difference between two proportions; however, the sample size for each cell is small. Because each individual answered a series of questions, the data from the Computer 1 and Computer 2 surveys could be pooled to estimate a fixed effects logit model (the Church survey was sufficiently different that we did not include the data in the regression). The coefficient on the dollar amount was positive and significant in a regression including the dollar amount of the cash offer, a dummy variable for the WTA cash question, and dummy variables for the scenarios, while the coefficient on the dummy variable for the WTA cash questions was negative and significant.

ities of the alternatives.¹⁴ The probability that one would be willing to accept cash compensation can be expressed as

$$P_c = P(\text{WTA cash}) \\ = \frac{\Phi_c * U(c_1, g_0, h)}{[\Phi_c * U(c_1, g_0, h) + U(c_0, g_0, 0)]} \quad [7]$$

Similarly, the probability that one would be willing to accept a public good can be expressed as

$$P_g = P(\text{WTA public good}) \\ = \frac{\Phi_g * U(c_0, g_1, h)}{[\Phi_g * U(c_0, g_1, h) + U(c_0, g_0, 0)]} \quad [8]$$

In a market choice framework, the probability that one would prefer a house with lower property taxes (more cash) but fewer public goods is measured directly in our survey for the population of respondents and can be expressed as

$$P(\text{prefer cash to public good}) = \\ \frac{U(c_1, g_0, h)}{[U(c_0, g_1, h) + U(c_1, g_0, h)]} \quad [9]$$

We can use the responses to the WTA questions to construct the probability that our respondents would choose cash over the public good in a compensation framework again using the assumptions of the Luce choice model. Under IIA, the odds of choosing between two alternatives do not change with the addition of a third alternative. Based on this assumption, the probability that an individual would prefer cash to a public good can be constructed from the odds of choosing cash over the status quo and the public good over the status quo in the WTA questions as follows:

$$P(\text{prefer cash to public good}) = \\ \frac{\text{odds(WTA cash)}}{\text{odds(WTA public good)} + \text{odds(WTA cash)}} \\ P_c / (1 - P_c) \\ P_g / (1 - P_g) + P_c / (1 - P_c) \quad [10]$$

Equation [10] is equivalent to the probability of choosing cash over the public good (see Appendix B for one method of deriving probability from odds ratios). Plugging equations [7] and [8] into the right-hand side of equation [10], it simplifies to

$$P(\text{prefer cash to public good}) = \\ \frac{\Phi_c * U(c_1, g_0, h)}{[\Phi_g * U(c_0, g_1, h) + \Phi_c * U(c_1, g_0, h)]} \quad [11]$$

Equations [9] and [11] both represent the probability that an individual prefers cash to the public good. If $\Phi_c = \Phi_g$, then equation [11] equals equation [9], and the probability that one chooses cash over the public good is equivalent in the compensation and market choice frameworks. However, if Hypothesis 1 is correct and $\Phi_c < \Phi_g$, then the right-hand side of equation [11] is less than the right hand side of equation [9]—more people will choose cash in a neutral choice framework than in a compensation framework.

To estimate the right-hand side of equation [9], we use the percentage of respondents who selected the house with the lower property taxes (more cash) over the one with more public goods. To estimate the right-hand side of equation [11], we use responses to the WTA questions. We take the percentage of respondents who were willing to accept cash, column (2), as an approximation of P_c and the percentage who were willing to accept the public good, column (3), as an approximation of P_g and plug these numbers into equation [10]. The resulting estimate, Table 4 column (4), is our prediction of the percentage of respondents who would prefer public goods to cash in the compensation framework.

Equations [7] through [11] are expressed in terms of an individual's utility function, while the data we used to construct the right-hand side of equation [11] are the population

¹⁴ This model relies on the Independence of Irrelevant Alternatives (IIA) axiom. Maddala (1983, 59–62) contains a brief presentation of the Luce choice model as well as McFadden's condition logit, which is a special case of the Luce model. Maddala also contains references to other discussions of the Luce choice model for more information.

choices (the probability that the community, rather than the individual, would choose the public good or cash). One way to justify this use of the data is to think of every individual's utility as containing a systematic component and a random component similar to the assumption used to derive McFadden's conditional logit model, which also assumes IIA for each individual making a choice (Madalla 1983, 60). For the conditional logit, information from the choices made by a variety of individuals, including the characteristics of the individuals and the objects of choice, is combined to estimate parameter values that can be used to derive the probability that a representative individual would choose a new alternative. In this case we know the choices the individuals in our survey made between cash and the public harm and between the public good and the public harm, and we want to predict the choice they would make between cash and the public good. We estimate each component of the right-hand side of equation [11] from the choices people made using the odds of choosing cash and the public good in the WTA questions.

Applying a sign test to these estimates, we evaluate the null hypothesis that the *predicted* percentage choosing cash over the public good from the compensation questions will be the same as the *actual* percentage of those preferring cash to the public good in the market choice (column [4] = column [5]).¹⁵ If the relative value of cash and the public good were the same in both the compensation and the market setting, there would be no reason to suspect that this simple prediction would be systematically biased in one direction or the other. If, on the other hand, our predicted percentage is consistently less than the actual percentage choosing cash, that provides evidence in support of our hypothesis that $\Phi_g > \Phi_c$.

Comparing the predicted percentage who would prefer cash to the actual percentage who chose cash in the market choice question with the description of the public harm, in all cases except one the predicted percentage in column (4) is lower than the actual percentages in column (5). We performed a two-sample Wilcoxon rank-sum sign test of the eleven pairs of results to test the hypothe-

sis that column (4) is less than column (5). The z statistic from the test was -1.94 , with a p -value equal to 0.05. Using the WTA responses, we under-predict the number of people who prefer cash to the public good in the market choice question.

The results suggest that the value of the public good increases relative to cash in the compensation setting and provide evidence in support of Hypothesis 1.

Hypothesis 2

Here we examine whether public goods are more effective than cash payments in mitigating the physical or psychic detriments associated with living near a public harm. We do this in a market choice context that minimizes associations of guilt or bribery. Recall that market choices in the Computer 2 survey came in two forms. In one version, the respondents were told of the existence of identical public harms located near each of the houses. The other version of the market choice question made no mention of nearby public harms in the description of the two houses. (See Appendix A for an example of both types of questions.) In the market choice questions, the individual's choice between the two houses has no effect on the siting of the public harm, the level of property taxes, or the public goods available to the neighborhood. Thus, preferences between the public good and the cash should not be inspired by any intrinsic motivations such as guilt or public spiritedness.

Using data from the Computer 2 survey, Table 5 presents the percentage of respondents who chose cash in the neutral market choice questions with and without the description of the neighboring public harm. In all the scenarios except the radio tower scenario, more people chose the cash payments (the house with lower property taxes) when the description of the two houses did *not* mention the public harm (column [2] > column [3]).

¹⁵ If guilt entered additively, then the test is less robust. However, given the results in Table 4, we would still find support for Hypothesis 1. The authors will provide a discussion of the additive case on request.

TABLE 5
PERCENTAGE CHOOSING CASH IN MARKET CHOICE QUESTIONS FROM
COMPUTER 2 SURVEY COMPARING QUESTIONS WITH AND WITHOUT PUBLIC
HARMS IN THE NEIGHBORHOOD

Scenario	(2) Percentage Choosing Cash with No Public Harm in Neighborhood	(3) Percentage Choosing Cash with Public Harm in Neighborhood	<i>p</i> -value for <i>z</i> -test of (2) > (3)
Landfill	65	52	0.07
Livestock farm	87	64	0.002
Airport	53	40	0.07
Radio tower	54	54	0.52
Waste-to-energy	64	47	0.03
Recycling transfer center	42	34	0.18
Compost center	58	50	0.17

Notes: Data include responses to market choice questions in Computer 2 sample. Sample size for each scenario in Table 2.

To test Hypothesis 2, we also pooled the responses across scenarios to investigate this question using regression analysis. The responses form a panel of dichotomous choice data in which each individual answered a series of questions. We used a random effects logit model to account for possible correlation in the error terms. The dependent variable equals 1 if the respondent chose cash (the house with lower property taxes) and zero if the respondent chose the public good. The model we estimated included socioeconomic characteristics, appropriate dummy codes for variance in the questions asked and their order in different surveys, the different cities in which the survey was administered, and the different scenarios to account for differences between the facilities and the public goods offered as compensation (see Table 2 for a description of the variables).

We test Hypothesis 2 by testing the significance of the dummy variable *Pub Harm* (*Pub Harm* equals 1 if a description of the nearby public harm common to both houses was included in the neutral market choice question). Table 6 contains the results from the random effects logit analysis for the variables of interest.¹⁶ Consistent with Hypothesis 2, the coefficient on *Pub Harm* is negative and significant. In contrast, the dollar amount (the decrease in taxes) is positive but insignificant. Respondents who received the mar-

TABLE 6
VARIABLES PREDICTING CHOICE OF CASH OVER
PUBLIC GOOD MARKET CHOICE QUESTIONS
FROM COMPUTER 2 SURVEY RANDOM EFFECT
LOGIT

Variable	Computer 2 Market Choice Data
Pub bad	-0.65*** (0.22)
Cash amount	0.0003 (0.0007)
Log likelihood	-541.71
Number of observations	879
Number of respondents	252

Notes: Data include market choice responses from Computer 2 surveys for all scenarios listed in Table 3. The dependent variable equals 1 if the respondent chose cash.

*** Significant at the 1% level.

ket choice questions that included a description of a nearby public harm located in the neighborhood were more likely to choose the public good over cash. Responses to the market choice question are sensitive to the inclusion of information about a nearby public

¹⁶ In addition to the results presented in Table 6, older respondents were more likely to choose the cash (the neighborhood with lower property taxes), while respondents who worked full-time or believed that improving the quality of local schools was very important were more likely to choose the public good. The full results of the regression are available from the authors.

harm even though both houses are located near public harms and the individual's choice of where to live will have no impact on the provision of the public harm, the public good, or the cash payments (lower taxes).

V. DISCUSSION

Context matters when evaluating preferences and attitudes towards compensation and the relationship between public goods, public harms, and money. Over a variety of situations with different public goods, different public harms, and across different samples of respondents, we find evidence that public goods become more valuable than cash in the presence of a public harm. We even saw a bias towards public goods in the neutral market choices, where one might expect that knowledge of a neighborhood characteristic common to both houses (the presence of a public harm) would not affect the choice between cash and the public good. This effect appears to be exacerbated by a move from a market choice framework to the compensation framework of the WTA questions.

In Section 2 we discuss a variety of motivations for both negative reactions to cash compensation and why it is possible that public goods or in-kind compensation in general may be preferred. Although this study does not provide any direct measures of the respondents' motivations, the results from testing both hypotheses support the idea that (for our sample as a whole) public goods balance the harms associated with public harms more effectively than cash. In the market choice questions, the decision to choose the house near the public good cannot be motivated by public-spirited altruism or guilt about accepting compensation for a public harm that might bring harm to neighborhood residents. Furthermore, as discussed in Section 2 and Table 3, the public goods were deliberately designed to be independent of physical problems associated with the public harms. Instead, our results suggest that, when faced with the prospect of living near a public harm, respondents preferred to also live near a public good.

In a compensation setting, acceptance of

cash is directly linked to acceptance of the public harm and the possible negative consequences of the facility because the respondent has the power to act against the siting by rejecting the compensation. Section 2 provides several explanations for possible negative reactions to cash compensation and less negative reactions to public goods as compensation. Across the scenarios included in the survey, we varied the level and type of disamenities and amenities associated with the public harms and public goods, as well as the nature of the "community service" provided by the public harm. The landfill scenario fits well with the Frey, Oberholzer-Gee, and Eichenberger (1996) notion of "crowding out" of civic duty motivations. In contrast, the livestock farm is a private business and although it may bring economic development to the area, people may not feel a "civic duty" to support it. In this case, the "bribery" motivation for opposing cash payments may be a more likely explanation for the results. However, our overall results are consistent with the notion that offers of public goods as compensation produce less guilt because the compensation itself provides public benefits.

Anecdotal evidence from two focus groups reinforces the notion that many people may view cash as an inappropriate method of compensation for a public harm. After the Church survey, we conducted two focus groups at one of the participating churches. When confronted with offers of cash compensation, the comments included the following:

- "It won't help if everyone just gets money."
- "The government shouldn't be able to just pay people to do whatever they want."

On the other hand, the offer of public good compensation elicited somewhat different comments:

- "I think it would be good for the whole neighborhood."
- "(The public goods) help make the neighborhood nicer, help address the problem."

In addition, the presence of a public harm might influence preferences for public goods over cash even when the scenarios are designed to minimize or eliminate intrinsic motivations or feelings of guilt. In economic terms, the presence of a public harm increases the "productivity" of public goods. We attribute this increase to respondents' perception that the public goods mitigate the perceived detriments inflicted on the community by the public harm.

After answering several questions about their willingness to accept compensation in exchange for allowing nuisance facilities into their neighborhoods, one of the focus groups was presented with the market choice question between two houses. One participant remarked, "This choice is easier to make; it's not an ethical dilemma." For these respondents, it was important that the public goods benefited the whole community, and they generally viewed the compensation questions differently from the market choice questions.

We note several interesting features regarding the survey results. In many respects, the WTA compensation questions elicited higher acceptance rates for the facilities in the survey than others have found (for example, Frey and Oberholzer-Gee [1997]; Kunreuther and Easterling [1990]). We attribute this difference to the type of question asked. In this study, the problems produced by the nuisance facilities were not threats to health or safety. Instead, we described problems with noise, odor, or aesthetic concerns. Furthermore, the scenarios are ones in which the property rights implied by the compensation question are realistic. Communities are often compensated in some way for hosting nuisance facilities, and some states have laws mandating such compensation (Portney 1985).

There were differences in the responses across the three survey samples and across scenarios. Generally, respondents in the Computer 1 survey were more willing to accept nuisance facilities for compensation of both kinds, while those in the Church sample were least willing to accept any type of compensation. There are several differences between the Church and Computer surveys. The surveys were administered in a different

format, and the Church sample has different demographic characteristics. In addition, the Church sample received the surveys from their churches (although they could take the survey home to fill out). The setting may have encouraged the respondents to respond more altruistically.

Furthermore, different scenarios elicited different reactions. For example, in the Radio Tower scenario there is no difference in the percentage choosing cash over the public good in the two versions of the market choice question (Table 5). It is possible that the disamenity associated with the Radio Tower (aesthetic) was not perceived to be harmful and thus did not generate strong reactions, though this is just speculation. In general, public preferences about nuisance facilities and the siting process are complicated. While this research demonstrates a general phenomenon, the precise reaction to different harms and public goods will probably vary from situation to situation, showing again how much context matters.

The data all come from a survey that posited hypothetical scenarios. Perhaps respondents would have responded differently if they had been facing actual siting proposals. The respondents to the survey by Frey, Oberholzer-Gee, and Eichenberger (1996) came from a town facing a real proposal to site a low-level nuclear waste facility (which was later sited in their town) and reacted negatively to cash compensation. In fact, the town eventually accepted a public good offered as compensation for hosting the facility. However, it would be valuable to compare the respondents' answers in situations in which the probability of the siting varied from completely hypothetical, to probable, to neighborhoods that already hosted facilities.

VI. POLICY IMPLICATIONS AND FUTURE RESEARCH

Our results highlight the importance of context to decision-making and preferences. In this experiment, the compensation framework elicited different responses than the neutral market framework and the existence of the public harm in the neutral market choice changed preferences for the public

good. It is widely recognized in the benefit transfer literature that WTP values obtained in one setting (e.g., fishing in a bay) should not be naively transferred to a different setting in which the attributes of the object being valued are different (e.g., fishing in a stream). The results presented in this paper examine another attribute of choice—the situation or context in which the choice is made. The relative values of cash and a public good may depend on the situation in which the individual makes the decision, in this case compensation versus market choice. The results have important implications for welfare measurement and appropriate compensation for damages to the public.

Many important environmental policy issues, including siting facilities and natural resource damages, require estimates of compensation to calculate theoretically consistent welfare measures. If the public prefers in-kind compensation, such as public goods, this greatly complicates the task of placing a monetary value on the public's WTA. Economists estimating nonmarket values have focused on WTP values because of the problems associated with measuring WTA. However, in addition to both theoretical and empirical evidence that WTP will be systematically lower than WTA (Hanemann 1991; Brown and Gregory 1999), reactions to the WTP framework may be very different than to the compensation framework. Furthermore, proposals for measuring WTA in a manner that abstracts from the compensation framework may understate welfare losses, as discussed in Peterson and Brown (1998). Just how to incorporate preferences for in-kind compensation into the standard benefit-cost metric remains an important area for research.

On a practical level, the results suggest that public goods or other in-kind compensation offer an attractive alternative to monetary compensation for public harm associated with facility siting, injuries to natural resources, and potentially to other threats to public health and safety. Monetary measures of WTA compensation may be too high when public goods are the preferred method of compensation. Public goods can represent a less expensive method of compensation

that leaves everyone better off. It is important to note that siting is a complex problem involving questions of physical and environmental suitability, politics, and environmental justice considerations. The amount and type of compensation offered represents one element of the process. However, several articles by economists about improving the siting process include some manner of compensation (see, e.g., Mitchell and Carson [1986]; Swallow, Opulach, and Weaver [1992]; and Kunreuther et al. [1987]). If public goods are cheaper than cash compensation, then our results suggest that public goods compensation will be much more effective for the company or municipality that must overcome opposition from citizen groups. Obviously, not every public good will be acceptable as monetary compensation. More research on this issue might uncover certain qualities of the public harms and public goods that the public finds more or less important.

Further research is needed to investigate how and why context has an effect on the relative value of goods. For example, we refer to the public good's general ability to mitigate the detriments caused by the public harm. However, our data do not provide information about the nature of the harms or how people perceive the relationship between public goods and harms. The results may also carry over to other situations in which compensation is due, such as natural resource damages from chemical spills. Such research will help identify more effective policies for environmental protection.

APPENDIX A

WTA Cash	WTA Public Good
<p>You live in the town of Pleasantville, close to the regional airport. The airport needs a new runway to accommodate an increase in the number of flights each day. The new runway is planned in such a way that the planes will take off and land over the town of Pleasantville.</p>	<p>You live in the town of Pleasantville, close to the regional airport. The airport needs a new runway to accommodate an increase in the number of flights each day. The new runway is planned in such a way that the planes will take off and land over the town of Pleasantville.</p>
<p>The flights will be scheduled every 30 minutes between the hours of 8:00 am and 5:00 p.m. every day (including Saturday and Sunday). Each time a plane lands or takes off, the noise will last for about 1 minute, and it will be loud enough to interfere with telephone calls and television viewing.</p>	<p>The flights will be scheduled every 30 minutes between the hours of 8:00 am and 5:00 p.m. every day (including Saturday and Sunday). Each time a plane lands or takes off, the noise will last for about 1 minute, and it will be loud enough to interfere with telephone calls and television viewing.</p>
<p>The town of Pleasantville will hold a vote on whether to allow the new runway to be built. As compensation for the noise created by the airplanes, each year the airlines that use the runway will pay into a fund that will be given to Pleasantville.</p>	<p>The town of Pleasantville will hold a vote on whether to allow the new runway to be built. As compensation for the noise created by the airplanes, each year the airlines that use the runway will pay into a fund that will be given to Pleasantville.</p>
<p>Town leaders plan to distribute the money to households in the city. For the next 15 years at tax time, the town will send each household a check for \$500.</p>	<p>The town does not have any parks, so town leaders plan to use the money to build, maintain, and staff a public park. The park will be located across the river from the town (no more than a 15-minute walk from most houses), where the noise from the airport is not as loud. The park will have a playground, fields for activities such as softball and soccer, and a 2-mile loop trail for jogging or biking.</p>
<p>Vote Yes: If the proposal wins, then the new runway will be built, and each year for the next 15 years you will receive a check for \$500.</p>	<p>Vote Yes: If the proposal wins, then the new runway will be built, and the town of Pleasantville will build a public park paid for out of a fund supported by the airlines that use the airport.</p>
<p>Vote No: If the proposal loses, then the runway will be built in a different location, and you will not receive any money.</p>	<p>Vote No: If the proposal loses, then the runway will be built in a different location and the park will not be built.</p>
<p>Please imagine that this is actually going to happen in your neighborhood. Think about your current situation and how this might affect your life. If you had to make this decision in real life, how would you vote?</p>	<p>Please imagine that this was actually going to happen in your neighborhood. Think about your current situation and how this might affect your life. If you had to make this decision in real life, how would you vote?</p>

APPENDIX A (continued)

Market Choice Question <i>With</i> Description of Nearby Public Harm	Market Choice Question <i>Without</i> Description of Nearby Public Harm
<p>Your company has asked you to relocate. You are trying to choose between two houses in different areas of the region—Neighborhood A and Neighborhood B. The difference is that homes in Neighborhood B are located no more than a 15-minute walk from a public park with a playground, fields for activities such as softball and soccer, and a 2-mile loop trail for jogging or biking. However, the yearly property taxes for homes in Neighborhood A will be \$500 lower than for homes in Neighborhood B for the next 15 years. The difference is that homes in Neighborhood B are located no more than a 15-minute walk from a public park with a playground, fields for activities such as softball and soccer, and a 2-mile loop trail for jogging or biking. However, the yearly property taxes for homes in Neighborhood A will be \$500 lower than for homes in Neighborhood B for the next 15 years.</p> <p>Otherwise the two houses are identical—the houses are the same size, they are the same distance from your office and shopping, the school districts are of equal quality, etc. Otherwise the two houses are identical—the houses are the same size, they are the same distance from your office and shopping, the school districts are of equal quality, etc.</p> <p>Both houses are located near the local airport. The flights are scheduled every 30 minutes between the hours of 8:00 am and 5:00 p.m. every day (including Saturday and Sunday). Each time a plane lands or takes off, the noise lasts for about 1 minute, and it is loud enough to interfere with telephone calls and television viewing.</p> <p>Because this problem is common to both neighborhoods, it does not make any difference between the neighborhoods.</p> <p>The park in Neighborhood B is located across the river where the noise from the airport is not as loud.</p> <p>Neighborhood A:</p> <ul style="list-style-type: none"> * no nearby public park * yearly property taxes \$500 lower than Neighborhood B for the next 15 years <p>Neighborhood B:</p> <ul style="list-style-type: none"> * homes located no more than a 15-minute walk from a public park with a playground, fields for activities such as softball and soccer, and a 2-mile loop trail for jogging or biking * yearly property taxes \$500 higher than Neighborhood A for the next 15 years <p>If you actually had to make this choice, which neighborhood would you prefer to buy a house in?</p>	<p>Your company has asked you to relocate. You are trying to choose between two houses in different areas of the region Neighborhood A and Neighborhood B. The difference is that homes in Neighborhood B are located no more than a 15-minute walk from a public park with a playground, fields for activities such as softball and soccer, and a 2-mile loop trail for jogging or biking. However, the yearly property taxes for homes in Neighborhood A will be \$500 lower than for homes in Neighborhood B for the next 15 years. The difference is that homes in Neighborhood B are located no more than a 15-minute walk from a public park with a playground, fields for activities such as softball and soccer, and a 2-mile loop trail for jogging or biking. However, the yearly property taxes for homes in Neighborhood A will be \$500 lower than for homes in Neighborhood B for the next 15 years.</p> <p>Otherwise the two houses are identical—the houses are the same size, they are the same distance from your office and shopping, the school districts are of equal quality, etc. Otherwise the two houses are identical—the houses are the same size, they are the same distance from your office and shopping, the school districts are of equal quality, etc.</p> <p>Neighborhood A:</p> <ul style="list-style-type: none"> * no nearby public park * yearly property taxes \$500 lower than Neighborhood B for the next 15 years <p>Neighborhood B:</p> <ul style="list-style-type: none"> * homes located no more than a 15-minute walk from a public park with a playground, fields for activities such as softball and soccer, and a 2-mile loop trail for jogging or biking * yearly property taxes \$500 higher than Neighborhood A for the next 15 years <p>If you actually had to make this choice, which neighborhood would you prefer to buy a house in?</p>

APPENDIX B

There are several ways to derive the relationship between the odds ratios and the probability of choosing one alternative over another. We would like to thank an anonymous referee for demonstrating how one can start with the equations that characterize the HIA property for this situation and derive the probability based on odds ratios. Here we present another derivation.

Define a = cash, b = public good, c = status quo, and V_i be the utility from choice i where $i = a, b, c$. Further, let

- probability that choose cash in WTA = $P_{ac} = P(V_a > V_c)$;
- probability that choose public good in WTA = $P_{bc} = P(V_b > V_c)$; and
- probability that prefer cash to public good = $P_{ab} = P(V_a > V_b)$.

From Luce Choice Model (Eq. 3.3, Maddala 1983, 60):

$$P_{ac} = \frac{V_a}{V_a + V_c}$$

and

$$P_{bc} = \frac{V_b}{V_b + V_c}$$

Finally, the odds of choosing cash in the WTA question, $odds_{ac} = P_{ac}/1 - P_{ac}$ and the odds of choosing the public good in the WTA question, $odds_{bc} = P_{bc}/1 - P_{bc}$. Starting with the odds ratios from the WTA cash and public good questions:

$$\begin{aligned} \text{Predicted } P_{ab} &= \frac{odds_{ac}}{odds_{ac} + odds_{bc}} \\ &= \frac{P_{ac}}{1 - P_{ac}} \div \left(\frac{P_{ac}}{1 - P_{ac}} + \frac{P_{bc}}{1 - P_{bc}} \right) \\ &= \frac{\left[\frac{V_a}{(V_a + V_c)} \right]}{\frac{V_a}{(V_a + V_c)} + \frac{V_b}{(V_b + V_c)}} \\ &= \frac{V_a}{V_a + V_c} \div \frac{V_b}{V_b + V_c} \\ &= P_{ab} \end{aligned}$$

$$\begin{aligned} &= \frac{\left(\frac{V_a}{V_c} \right)}{\left(\frac{V_a}{V_c} + \frac{V_b}{V_c} \right)} \\ &= \frac{V_a}{V_a + V_b} \\ &= P_{ab} \end{aligned}$$

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