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The Efficiency of Political Mechanisms for Siting Nuisance Facilities: Are Opponents More Likely to Participate than Supporters?

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Abstract

Public opposition often hinders the siting of nuisance and noxious facilities. However, there is often support for the siting plan within the community, especially when the facility will bring economic development or a compensation package funded by the company siting the facility. Why have opponents of these facilities been so effective compared to supporters? This article presents evidence that opponents of siting proposals are much more likely to vote or engage in other collective action, while supporters are more likely to remain passive and not take action to advance their position. The results suggest that political mechanisms for determining host communities for facilities such as town meetings or referenda may not accurately represent the preferences of the community and that opportunities for siting may be missed.

Key Words: facility siting, collective action, NIMBY

1. Introduction

A central worry in democracies is the representativeness of the politically active citizens relative to the entire population. In the United States, not every eligible voter actually votes, and even fewer citizens take part in other types of collective action such as attending meetings, donating money, writing letters, or protesting on the street. ''If resources (for political participation) were distributed equally, then we could interpret the level of activity as a barometer of the intensity of preferences. However, as is well known, political resources are not apportioned equally, a fact that poses one of the greatest challenges to fairness in a democracy'' (Verba et al., 1995, p. 182).

In this study we examine how the relationship between political activism, individual characteristics, and individual preferences can influence local land-use decisions. We demonstrate that an individual's opinions about a variety of siting proposals for nuisance facilities are systematically related to certain personal characteristics that also influence his or her propensity to vote or engage in other collective action. We find that people who

oppose proposed siting projects are also those who are more likely to actually organize, attend meetings, or vote, while supporters are more likely to be politically passive. The results is that siting decisions of this type may in the end be poor reflections of majority preferences in the affected communities. If siting decisions are influenced by political actions (in addition to criteria for the physical suitability of proposed sites or the proximity to the appropriate markets) and if supporters are not adequately represented in the political action that accompanies these local land use decisions, then potential siting opportunities may be missed.

To address these issues we conducted a survey-based experiment that presented individuals with a series of siting scenarios, each offering some specified compensation for allowing the siting or expansion of a nuisance facility in their neighborhood. They were asked whether they would support or oppose the offer. Comparing the characteristics of those who supported (and opposed) the offers in our experiment to characteristics often associated with voters and people who engage in collection action in general, we make predictions about the likelihood that supporters (and opposition) would actually vote in a real referendum or engage in some sort of collective action.

The article is organized as follows. Section 2 describes the survey and our predictions about who will support or oppose the siting scenarios. Section 3 presents the results from our analysis of the survey data and a discussion of the variables that significantly influence support or opposition for the siting proposals. Section 4 reviews the empirical literature on the demographic characteristics of politically active citizens, and then in Section 5 we assess the likelihood that the supporters of and opponents to the siting scenarios in our experiment will engage in collective action. We develop profiles of those who support and oppose sitings in our survey and compare these to the profiles of voters and activists from the literature. Finally, Section 6 offers some conclusions and implications of this research.

2. Who supports siting proposals?

2.1. Survey design

The survey presented respondents with a variety of scenarios in which a nuisance facility might be sited in their neighborhood or an existing facility might be expanded. Each scenario describes the facility and the disamenities associated with the facility. The scenario also describes the compensation package offered in exchange for hosting the facility.[1] The compensation consists of either a specified amount of money to be paid to every individual in the neighborhood or a particular public good to be supplied to the neighborhood. The respondent was then asked whether they would vote in favor of the siting package or against the package. Each respondent was asked a series of such questions. For each scenario, a respondent was offered *either* a public good or cash as compensation but not both. However, over the course of the survey respondents answered a mixture of the two types of questions. In addition, we collected demographic data and responses to a set of attitudinal questions.

Table 1 describes the outlines of each scenario.[2] In an effort to achieve some generality and robustness in our results, a variety of nuisance facilities were depicted in the survey including some that provided a public good for the greater community (for example, the expanded airport) and others in which the benefits from the nuisance accrued to a private company (for example, the livestock farm).[3] The disamenities associated with the facilities are described as noise, odor, or aesthetic problems. We also offered different public goods as compensation in the different scenarios. All the public goods can be considered local public goods, and some are excludable (such as the community center) while some are not (such as the landscaping along the streets).

2.2. *Who is more likely to support sitings: predictions*

The decision to support or oppose the proposed siting involves weighing its expected costs and benefits broadly defined. The individual considers the impact of the facility on his or her life and, if motivated by altruism, the lives of others in the community. The costs to the individual include lower quality of life, potentially lower property values, and a bad public

Table 1. Scenario descriptions.

Scenario	Description	Disamenity	Amount of Cash Compensation	Public-Good Compensation
Superfund	Town has money to incinerate dirt and fully clean site but is offered cheaper option of capping site and losing future use of land	Restricted land use, aesthetic	$500	Fire trucks, police cars, high school repairs
Burning yard Waste[a]	Burn yard waste from Hurricane Fran for 3 weeks	Smoke	$200	Neighborhood road and sidewalk repair
Landfill wall	Landfill is expanding, company wants to provide compensation instead of building promised wall between neighboring houses and landfill	Noise	$600	Paved walking trail
Farm	Neighboring farmer wants to raise livestock instead of grow corn	Odor	$1,000	Community recreation center
Airport	Airport wants to add a new runway with a flight path over neighborhood	Noise	$500	Park
Radio tower	Company wants to install 300 foot radio tower in neighborhood	Aesthetic	$400	Artificial lake for boats and swimming

Note. [a]Scenario only for Greensboro, North Carolina, sample.

image of neighborhood. These costs are countered by the potential benefits of the scenario. If the facility benefits the community or brings economic development (such as an expanded airport), then the respondent might receive direct benefits from the facility. If the host community receives compensation from the company or government siting the facility, then this compensation may bring benefits as well (see Frey et al., 1996, Frey and Oberholzer-Gee 1997, and Mansfield et al., 1998, for evidence that cash compensation might lower levels of support for the facility). In addition, people may feel a sense of pride in doing their civic duty by allowing the siting.

An individual's sociodemographic characteristics may affect his or her opinion of the siting package. These variables shape the preferences that the individual expresses, they influence which costs and benefits are relevant to his or her life, and they affect the degree to which the individual feels civic duty or altruism.

A variety of articles discuss the relationship between homeownership and opposition to siting proposals through the impact of noxious and nuisance facilities on property values. In hedonic price analysis, such as Smith and Desvousges (1986), decreasing distance to hazardous waste facilities lowers property values. DiPasquale and Glaeser (1999) present a theoretical model that predicts that homeowners are more likely than renters to invest in public goods because of the potentially positive effect on their property values. Also, since homeowners are generally less mobile than renters, they are more likely to enjoy the future benefits from an improved community. Using survey data from the General Social Survey, the authors find support for the idea that homeowners are more likely to invest in their communities where investment was proxied by questions about membership in nonprofessional organizations, voting, gardening, and knowledge of local politics.

The survey for this study asks respondents to consider allowing nuisance facilities to be sited in their neighborhood in exchange for compensation. In DiPasquale and Glaeser (1999), homeowners were only 6 percent more likely than renters to say that they would "work to solve local problems." Although it is homeowners who suffer if property values decline, both renters and homeowners will suffer from a reduction in day-to-day quality of life as a result of the nuisance facility siting. While in general we expect that homeowners would be more likely to oppose sitings, if the facility is not expected to impact housing prices significantly, we may observe no difference in the responses of homeowners and renters.

An individual's income should also impact their willingness to accept a facility siting, especially when the siting is accompanied by a compensation package as in our survey. If the environment is a normal good, higher-income individuals will demand better neighborhood amenities. In addition, higher-income individuals will require more compensation to accept the sitings than lower-income individuals, all else equal.

Finally, we predict that individuals who are at home during the day will be more likely to oppose the facility siting. Many of the scenarios described in our survey present problems related to noise and traffic during daytime hours. Thus people who work at home or are retired would suffer a greater loss of utility than people who work full time outside the house.

We have no a priori predictions about the effect of education and age on support of the siting proposals. For example, younger people may oppose sitings if they believe they will

be living in the neighborhood for many years. Alternatively, younger people may be more mobile than older people and thus discount the future impacts of the facility. Smith and Desvousges (1986) found that empirically education was positively related to the demand for living farther from a hazardous waste facility, while older people were more willing to live near the facility.

3. Who is more likely to support sitings: Results

The data for our analysis come from a survey conducted between June and December 1997 in six cities on the East Coast.[4] Respondents to the self-administered computer-based survey were recruited through a mall-intercept format. In Table 2 we compare the demographics of our respondents with the 1990 census for the county in which the mall was located. While there is considerable variation across the six malls, in general our sample underrepresents individuals over 60 years of age or with incomes over $75,000 (adjusting data from the 1990 census with the Consumer Price Index). In addition, on average sample respondents received more education than the general population of the county. In five of the six malls we oversample the 21- to 30-year old age group and undersample whites. Both the mall location and computer format of the survey probably contributed to the makeup of the sample. However, in the regression results presented below we control for the characteristics of the sample. Comparing renters and owners in Table 3, our sample demographics correspond to demographics of renters and owners from the General Social Survey (GSS) for the years 1985 to 1994 as reported in DiPasquale and Glaeser (1999), although our sample is better educated and contains a higher percentage of African Americans. In the GSS sample 64 percent of the respondents owned their own homes, while in our sample 63 percent of respondents own homes.

The simple percentages of people who said yes, displayed in Table 4, show some variety across the scenarios. In all but one scenario, between 40 percent and 55 percent of the respondents favored the siting package, while the remainder opposed it. Because support and opposition to the siting packages is so evenly split, these results underscore the need to know who opposes and supports the facilities before drawing conclusions about the likelihood that a community will actively protest in opposition to a siting proposal. If the entire sample was opposed to a particular siting package, then we could just use the characteristics of the sample to represent the characteristics of the opposition (as in Hamilton, 1993). However, in this case we need to know the characteristics of the two groups before we can make any predictions about which group is more likely to engage in collective action.

The responses form a panel of dichotomous choice data in which each individual answered a series of questions.[5] To account for possible correlation in the error terms, we used a random-effects probit model.[6] In the results reported below, the dependent variable equals one if the individual accepted the siting package and zero if he or she voted no. We estimated three models with appropriate dummy codes for variance in the questions asked and their order in different surveys, the different cities, and the different scenarios to account for differences between the facilities and the public goods offered as

Table 2. Demographics for six mall samples (collected in 1997) comparison with (county averages from 1990 census).[a]

Variable	Cary, North Carolina (Wake County)	Tampa, Florida (Hillsborough County)	Miami, Florida (Broward County)	Rochester, New York (Ontario, County)	Freehold, New Jersey (Monmouth, County)	Greensboro, North Carolina (Guilford County)
White	81%	77%	68%	90%	67%	69%
	(77%)	(83%)	(82%)	(97%)	(87%)	(72%)
Black	12%	6%	19%	6%	11%	26%
	(21%)	(13%)	(15%)	(2%)	(9%)	(26%)
Own home[b]	53%	53%	64%	46%	76%	69%
	(61%)	(63%)	(68%)	(73%)	(73%)	(61%)
Male	47%	53%	47%	74%	37%	39%
	(49%)	(49%)	(48%)	(49%)	(48%)	(47%)
Beyond HS[c]	88%	66%	68%	86%	78%	56%
	(64%)	(47%)	(45%)	(48%)	(55%)	(51%)
Income < $35,000[d]	41%	64%	40%	59%	22%	48%
	(37%)	(48%)	(41%)	(40%)	(27%)	(46%)
Income $35,000–$75,000[e]	40%	34%	60%	33%	48%	42%
	(42%)	(38%)	(42%)	(44%)	(38%)	(38%)
Income > $75,000[f]	19%	2%	0%	8%	29%	10%
	(22%)	(14%)	(17%)	(16%)	(35%)	(16%)
Age 21–30	44%	36%	28%	48%	20%	19%
	(26%)	(22%)	(17%)	(19%)	(19%)	(22%)
Age 30–50	37%	43%	55%	38%	65%	54%
	(48%)	(43%)	(38%)	(43%)	(47%)	(42%)
Age 50–60	14%	4%	9%	8%	13%	15%
	(11%)	(13%)	(11%)	(12%)	(14%)	(13%)
Age >60	5%	17%	8%	6%	2%	13%
	(15%)	(23%)	(33%)	(25%)	(25%)	(23%)

Notes. [a]Census figures for the county in which the mall is located are in parentheses below the percentage for the mall sample.

[b]Census figures based on percentage of occupied housing that was owner occupied.

[c]Census figures based on educational attainment for persons 18 years and over.

[d]1990 census figures based on household income from 1989 were adjusted using the Consumer Price Index to 1997 dollars. 1990 census income category corresponding to incomes of $35,000 or less in 1997 dollars was $27,500 or less (approximately $33,770 or less in 1997 dollars).

[e]1990 census income category corresponding to $35,000 to $75,000 in 1997 dollars was $27,500 to $60,000 in 1989 dollars (approximately $33,770 to $73,680 in 1997 dollars).

[f]1990 census income category corresponding to $75,000 or more in 1997 dollars was $60,000 or more (approximately $73,680 in 1997 dollars).

compensation. Table 5 contains a description of the variables of interest in this study and their means and standard deviations for the sample used in the regressions. After deleting incomplete responses, a total of 258 people answered the survey questions used for this study yielding 1,405 responses to the six different scenarios.

Table 3. Homeowners and renters comparison of survey averages with GSS averages from 1987 to 1994.

Variable	Homeowners Survey	Homeowners GSS	Renters Survey	Renters GSS
Vote	78%	77%	54%	52%
Married	67	66	30	33
Male	46	44	47	43
Black	15	8	22	18
16 or more years school	44	23	31	19

Table 6 contains the significant variables of interest from the probit analysis predicting the acceptance of the siting proposal. The results from this table are taken from regressions that included other socioeconomic characteristics and dummy variables. The results from the full model are presented in the appendix. Contrary to the predictions of theory, home ownership (*own home*) is positive and significant in model (1). A simple random-effect probit model regressing WTA on homeownership alone produces a negative but insignificant coefficient on homeownership. However, when other explanatory variables are added to the regression, the coefficient on homeownership becomes positive, even when highly correlated variables such as the number of years a respondent had lived in the state are excluded, from the regression. Model (2) contains interaction terms between income and homeownership and income and renting. Interacting homeownership and income should capture the effect of property value on support for the siting packages. The coefficient *income*own home* is significant and has the expected negative sign, while the coefficient on *income*rent* is negative but insignificant. The income effect on support for siting proposals appears to be stronger for homeowners than for renters. In model (3), we compared the willingness of renters and homeowners to accept public goods as compensation versus cash payments. The excluded category is renters offered cash payments. Both renters and homeowners prefer public goods as compensation, and the coefficients on *public good*rent* and *public good*own home* are similar in size. *Cash*own home* is also positive and significant.

From the three regression models it appears that while high-income homeowners may oppose facility sitings at a greater rate than high-income renters, homeownership by itself

Table 4. Percentage voting to accept siting package by scenario.

Scenario	Percent Yes Full Sample	Percent Yes If Voted in Last Presidential Election	Percent Yes If Did Not Vote in Last Presidential Election
Superfund	30%	30%	32%
Landfill	40	40	40
Burning yard waste	42	44	39
Airport[a]	44	40	51
Farm	54	53	58
Radio tower[a]	54	46	71

Note. [a]Difference between column 3 and column 4 significantly different at the 10% level using *z*-test for the difference between two proportions.

Table 5. Variable definitions, means, and standard deviations.

Variable	Definition	Means (Standard Deviation)
More industry[a]	Attracting more industry to this state (1 = not important, 7 = very important)	5.16 (2.04)
Improve schools[a]	Improving the quality of schools in this state (1 = not important, 7 = very important)	6.21 (1.53)
Own home	Dummy variable = 1 if own your home, = 0 if rent	0.64 (0.48)
Income	Income measured in categories, mean value in category used	$40,735 ($23,165)
Income*own home	Homeowners' income	$48,048[b] ($23,416)
Income*rent	Renters' income	$27,866[b] ($16,013)
Cash*own home	Dummy variable = 1 if own home and were offered cash compensation, = 0 otherwise	0.32 (0.47)
Public good*own home	Dummy variable = 1 if own home and were offered public good compensation, = 0 otherwise	0.32 (0.47)
Public good*rent	Dummy variable = 1 if rent and were offered public good compensation	0.18 (0.39)
Age	Age measured in categories, mean value in category used	40.20 (12.91)
Student	Dummy variable = 1 if a student, = 0 otherwise	0.04 (0.19)
Other work	Dummy variable = 1 if indicated "other work" on survey, = 0 otherwise	0.03 (0.17)
Work	Dummy variable = 1 if worked full- or part-time, = 0 otherwise	0.74 (0.44)
Beyond HS	Dummy variable = 1 if education beyond high school graduate, = 0 otherwise	0.66 (0.47)
Survey time	Minutes spent responding to survey	13.36 (14.70)
Cash dummy	Dummy variable = 1 if offered cash compensation, = 0 if offered public good	0.50 (0.50)
Cash amount	Dollar amount of cash compensation, = 0 if public good compensation	635.96[b] (287.13) Max $1200 Min $200
Number of respondents		258
N	Number of observations	1405

Notes. [a]In the first version of the survey, the attitude codes ranged from 1 to 4, while in the second version they ranged from 1 to 7. Responses from the first survey were recoded as follows: 4 = 7, 3 = 5, 2 = 3, 1 = 1. [b]Mean of variable if value > 0.

does not have the expected negative relationship with support for siting proposals. It is possible that the respondents did not expect the nuisance facilities to impact housing prices significantly. If this were the case, then objections to the siting proposals would

Table 6. Random effects probit model results selected variables predicting support for the siting coefficients and (standard errors).

Variable	Model (1)	Model (2)	Model (3)
More industry	0.05*** (0.02)	0.05*** (0.02)	0.05*** (0.02)
Improve schools	−0.05* (0.03)	−0.05* (0.03)	−0.05* (0.03)
Own home	0.15* (0.09)	0.17 (0.17)	
Income*own home		−5.33E−06*** (2.20E-06)	
Income*Rent		−4.67E−06 (4.08E-06)	
Cash*own home			0.25** (0.12)
Public good*own home			0.66*** (0.21)
Public good*rent			0.60*** (0.21)
Income	−5.20E−06*** (2.01E-06)		−5.20E−06*** (2.01E-06)
Age	−0.01*** (0.004)	−0.01*** (0.004)	−0.01*** (0.004)
Student	−0.54** (0.23)	−0.50** (0.23)	−0.50** (0.23)
Other work	−0.58** (0.24)	−0.58** (0.24)	−0.58** (0.24)
Beyond HS	−0.21*** (0.09)	−0.21*** (0.09)	−0.21** (0.09)
Survey time	1.13E-04** (4.74E-05)	1.13E-04** (4.75E-05)	1.14E-04** (4.76E-05)
Cash Dummy	−0.48*** (0.19)	−0.48*** (0.19)	
Cash amount	7.30E-04*** (2.75E-04)	7.30E-04*** (2.75E-04)	7.22E-04*** (2.75E-04)
N	1405	1405	1405
LL	−870.43	−870.42	−869.54

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

arise because of everyday quality-of-life concerns that would impact both renters and owners.

Not surprisingly, income is negative and significant. Higher-income individuals place less value on the compensation package, and if the environment is a normal good, they place more value on the disamenities caused by the facility.[7] Education beyond high school (*Beyond HS*) and age also reduce the likelihood of support for the siting package.

The employment effects show an interesting pattern. The omitted employment category is those who work full- or part-time. Compared to this group, the coefficients on the dummy variables for people who are students or indicated "other work" on the survey are negative and significant. The additional categories included unemployed and seeking work, not seeking work, and retired. Unemployed and not seeking work both have negative but insignificant coefficients, while retired is positive and insignificant (see full results in the appendices). People who do not work full- or part-time are likely to be at home for more hours than people who work, so the problems associated with the facilities may have a larger impact on their lives, especially since some of the scenarios describe problems that occur between 9 a.m. and 5 p.m. However, the results suggest that retired people may have more in common with people who are currently working than people who stay at home.

Two of the attitude variables were significant: the importance of attracting industry to the state (*More Industry*) and the importance of improving the quality of schools in the

state (*Improve Schools*). As intuition suggests, people who think attracting industry to the state is more important are also more willing to accept the siting package. Improving secondary school quality has a negative sign. The attitude may correlate with having children, thus indicating that people with children are less likely to support the siting of nuisance facilities.

Looking at the variables related to the survey itself, the amount of time a respondent spent answering the survey (*Survey time*) is positive and significant. This result is discussed in more detail below. The dummy variable for cash compensation as opposed to public-good compensation (*Cash dummy*) is negative, indicating people were more likely to accept the siting proposal when the compensation was a public good.[8] However, the dollar amount of the cash offer was positive and significant. Conditional on being offered monetary compensation, increasing the monetary incentive to accept the facility increased support.[9]

The version of the survey administered in all the cities except Greensboro, North Carolina, questioned the respondents after each scenario about how certain they were of their answers.[10] On a scale of 1 (not certain) to 7 (very certain), the mean level of certainty among those who answered yes was 5.35 (with a standard deviation of 1.6), while the mean level of certainty for those who answered no was 6.01 (with a standard deviation of 1.47). The means are significantly different at any level of significance (the t statistic is 5.21 with 634 degrees of freedom).[11] This indicates that people who voted no are more certain of their answers than people who voted yes. Combined with the positive and significant coefficient on time spent on the survey, we suggest that people who voted yes had a harder time making a decision: they spent a longer time on the survey and are less certain of their answers. In essence, a no vote against the siting proposal is a vote for the status quo. The decision to vote yes implies moving away from the status quo and may require more thought on the part of the respondent. This lack of certainty given a yes vote suggests that there is a lower likelihood of commitment to collective action compared with those who vote no.

Finally, we asked respondents whether they had voted in the last election. In Table 4, we break down the percentage of people who answered yes to the siting proposal by reported voting behavior. In four of the six scenarios, more nonvoters supported the siting proposal than voters did, and in two of these scenarios (airport and radio tower) the difference was significant.[12] A simple probit model regressing support for the facility against vote yields a negative and significant coefficient on vote.[13]

4. Who is more likely to engage in political action?

The results of the survey indicate the stated preferences of our respondents. If these siting proposals were actually offered in a particular community, who from this sample would actually vote? Who would attend neighborhood meetings or organize a demonstration? In this section of the article we review the literature on the characteristics of the politically active population, both voters and those who engage in other types of political action.

If asked, people will often give their opinion about an issue, but not all of these people

will take action to support their position. There are many reasons that people do not take action. Some people do not act because they do not have a strong opinion or because the issue is of very little importance to them. However, many others do not act because of time or financial constraints or a lack of knowledge about how to get involved (Walsh and Warland, 1983; Verba et al., 1995).

After deciding whether to support or oppose the siting proposal, the decision about whether to engage in collective action to promote one's position involves a second tradeoff—weighing the costs of collective action against its expected benefits. Here, collective action includes activities such as voting, attending neighborhood meetings, donating money to organizations supporting one's position, community organizing, or participating in demonstrations. The costs include the cost of time and money spent on these activities. The benefits from action are related to the level of support or opposition the individual feels toward the siting package. These benefits are weighted by the subjective probability the individual attaches to the likelihood that his or her actions will make a difference. Individuals may gain utility from directly participating in collective action, as well.

As with the decision to support or oppose the siting proposal, the probability of political action is conditioned by sociodemographic characteristics. Not all of these characteristics can be measured, but observable characteristics such as age, education, and income appear to be highly correlated with voting and other collective action. While it is not always the case that people with different demographics have different opinions or that the voting population is not representative of the nonvoting population (Verba et al., 1995, p. 167; Wolfinger and Rosenstone, 1980, pp. 105–114), in our study this seems to be true.

Many studies address the question of who votes and why, while fewer studies examine the characteristics and motivations for other types of political action. Empirically, many studies note a correlation between higher socioeconomic status and higher levels of voter participation. Verba et al.'s (1995) model of civic volunteerism links skills acquired through life activities (such as attending school, one's family and social network, or one's job) with the propensity to participate in different types of political activities. According to Verba et al., "When inputs of time and money are coupled to civic skills, citizens become not only more likely to participate but also more likely to be effective when they do" (p. 271).

The literature that examines these models finds a surprising degree of similarity among the types of people who participate in political activities. In general, voters and other types of activists share a number of common sociodemographic characteristics that distinguish them from nonvoters and nonactivists. We use this fact to predict the activism levels of opponents and supporters of the siting proposals in our survey based on their demographics. In Table 7 we list the variables from Table 6 that are both significant predictors of opposition to the siting proposals detailed in our survey and featured in the empirical literature as correlated with voting or other political activities. Below we present the attempts of various researchers to sort out the impact of different individual characteristics on the potential for political action. The following discussion is not meant as a survey of all the factors that influence political action, just the ones that are relevant to this study. There are other variables that are correlated with political action that are not

Table 7. Survey results, predicted impact of variables on collective action, likelihood they will vote or engage in collective action.

Variable	(2) Sign of Coefficient in Probit Model	(3) Predicted Impact on Voter Turnout	(4) Predicted Impact on Other Collective Action	(5) Group with Greater Probability of Engaging in Collective Action
Education	Negative	Positive	Positive	Opposition
Income	Negative	Positive	Positive	Opposition
Age	Negative	Positive	Positive?	Opposition?
Certainty	Negative	Positive	Positive	Opposition
Own home	Positive	Positive	Positive?	Supporters?
Income*own home	Negative	Positive	Positive?	Opposition?
Student	Negative	Positive		Opposition

significant predictors of opposition to the siting plans in our survey and so are not included in our discussion.

We begin with voting. According to Verba et al. (1995), voting is in many ways the most accessible political act but also is viewed as one of the least effective in conveying specific views. More people vote than participate in other types of political action. Studies by Wolfinger and Rosenstone (1980) and Verba et al. (1995) indicate that education is one of the most important determinants of voting behavior: more educated people are much more likely to vote. Theoretically, education is thought to influence voting behavior in several ways. Education provides individuals with the skills needed to participate in the political process, including reading and writing. It is also thought that our educational system instills civic values in individuals and that more education may make people more interested in politics and better able to understand the issues. More highly educated people are also more likely to have jobs or social networks that provide additional opportunities to develop civic skills. Wolfinger and Rosenstone (1980) report that in 1972, 69 percent of those with only a high school degree voted compared to 79 percent of those who attended some college, 86 percent of those who graduated from college, and 91 percent of those who attended one or more years of graduate school (only 38 percent of people with less than five years of education voted). Verba et al.'s analysis of voting finds that education contributes more indirectly through the development of political interest and information that increase voter turnout.

In Wolfinger and Rosenstone (1980) income is also positively correlated with voting, although it has a somewhat smaller effect on turnout than education. With a higher opportunity cost of time, one might think that higher income individuals would not vote as much. On the other hand, higher-income individuals perceive higher benefits from participating in the political process. Wolfinger and Rosenstone find that of those earning between $2,000 and $7,500 (in 1972) 57 percent voted compared to 86 percent of those earning $25,000 or more. Using an additive scale that counts political acts, Verba et al. find that income is positively correlated with all types of political activity. In their study, the difference in voter turnout between the richest (incomes over $75,000) and the poorest (incomes under $15,000) shows a large disparity with 86 percent of the richest citizens in

their sample voting compared with 52 percent of the least well off.[14] However, Verba et al. also demonstrate that while income is a powerful predictor of monetary donations to political causes (in fact it is the only predictor), it is less important in predicting the amount of time an individual donates to a political cause.

From a bivariate correlation of voting and age in Wolfinger and Rosenstone, it appears that middle-aged people vote more than the young or the old. However, after controlling for factors including gender and marital status, voting is positively correlated with age with some leveling off in later years. Civic skills increase with age and life experience, making participation less costly and more rewarding. However, the very elderly may be hampered by health considerations. Finally, while one's intuition might suggest that people with occupations that allow them more free time vote in larger numbers, this does not seem to be the case. While greater free time is associated with higher turnout, Verba et al. suggest that civic skills can be developed in the workplace (which will lead to an increase in turnout), counteracting the effect of a busy schedule on turnout. Wolfinger and Rosenstone present evidence of higher turnout for people with less free time and slightly lower turnout among the unemployed but also report that housewives seem to vote at the same rate as working men and women. Students vote at a higher rate than nonstudents of a similar age.

In addition to voting behavior, a few studies have attempted to uncover the characteristics of people who engage in other forms of political action. Again education remains a consistent and important determinant of the likelihood that a person will engage in collective action in all of the studies we examined. Verba et al. found that education was linked to higher levels of participation in time-based acts such as letter writing, attending meetings, and protesting. Walsh and Warland (1983) studied the characteristics of active protesters and free-riders in the communities around the Three Mile Island nuclear facility.[15] In addition to higher levels of education, active protesters had higher incomes, more liberal political views, and higher-status jobs when compared to free-riders.

Oliver (1999) examines the difference in political participation rates across cities. He also found that voting and other activities such as contacting local officials and attending meetings increase with an individual's level of education, income, age and homeownership.[16] Oliver (1984) looked at token versus active members in neighborhood associations. Again, level of education emerged as one of the most consistent differences between active and inactive members. Homeownership is more common among members than nonmembers, although current activists are less likely to own homes than past activists. In her study, income was a weak predictor of membership versus nonmembership in a neighborhood association but did not distinguish between active and token members. She cites several studies where age was not found to be a predictor of community participation. However, middle-aged people (35 to 60) have been found to participate more in other studies (Parkum and Parkum, 1980). As discussed above, DiPasquale and Glaeser (1999) found evidence that homeowners were more likely to invest in their communities than renters, but they were only slightly more likely to "help solve a local problem."

Several studies have also examined the relationship between voting and other types of collective action. Oliver (1984) found a link between all types of political participation and active membership in a neighborhood association. Molleman (1973) presents survey

results in which people who admitted to engaging in some sort of organized protest were more likely to be voters than people who did not. In logit analysis by Walsh and Warland (1983), activists were more likely to have voted in the previous presidential election than free-riders. Finally, Hamilton (1993) discusses a variety of studies that link voting with collective action, in addition to evidence from consulting reports commissioned by hazardous-waste disposal companies that these companies believe that voting is correlated with other types of protest action.

5. Are siting supporters more likely to be politically active?

Table 7, columns (3) and (4), summarizes the above discussion of how different individual characteristics affect the likelihood of political action. It focuses on the variables that were found to be significant in our regressions. In general, political activity increases with education, income, and age. All types of political activity are correlated and voters participate in other types of collective action at higher rates than nonvoters do. Finally, being a student is correlated with higher voter turnout, while homeownership may be correlated with greater political action.

How do the characteristics of supporters and opponents in our survey compare to the characteristics of voters and those who engage in other types of collective action? In our study, compared to opponents of the siting proposals, supporters are younger and have lower incomes and lower education levels. Wealthy homeowners are more likely to be in opposition of the facility, as are students compared to full- and part-time workers. Thus supporters appear less likely to be politically active. Only the home ownership variable predicts that supporters would be more active than opponents.

Supporters were less certain of their answers and spent more time on the survey. The empirical literature on voting and activism provides no direct corollary to our *Certainty* variable. However, activists do tend to be more ideologically committed than nonactivists. Moreover, the certainty variable will reflect how certain the respondent feels about the costs and benefits of the project, regardless of the accuracy of his or her assessment. Given this, we believe that the negative correlation between certainty and voting yes supports the notion that the opposition is more likely to vote or protest.

Holding all else constant, it appears that people who oppose the siting packages offered in our survey are much more likely to vote or engage in collective action than are supporters. Regardless of other factors that may increase or decrease an individual's motivation to protest or demonstrate support for the siting of a facility, the demographics of the two groups favor larger participation by the opposition.

What effect do changes in these demographic characteristics have on the probability of supporting the siting proposals? Table 8 contains the predicted probability of accepting the siting proposal for four hypothetical individuals using the results from Model (1) in Appendix B.[17] The first hypothetical individual has the mean characteristics of the sample, the second has the characteristics of someone who opposes the siting proposal (older, higher income, higher education, and a student or other worker), the third is the same individual only working full- or part-time, and the fourth individual resembles the

Table 8. Predicted probability of answering yes for four hypothetical individuals using coefficients from model (1).

Individual	Characteristics	Predicted Probability of Yes Vote
Mean	Mean values of all variables	43%
Opponent 1	Income $70,000 Age 55 Beyond high school education Student or other work (other employment categories set equal to 0) Mean values of all other variables	12
Opponent 2	Income $70,000 Age 55 Beyond high school education Work full- or part-time (other employment categories set equal to 0) Mean values of all other variables	28
Supporter	Income $20,000 Age 25 No education beyond high school Work full- or part-time	64

supporters of the siting proposals (younger, lower income and education, work full- or part-time). The probability that a member of the opposition will vote yes on the proposals in our experiment is 12 percent (or 28 percent if they work full- or part-time) compared to 64 percent probability of a yes vote by our hypothetical supporter.

6. Conclusions

The difficulties associated with siting noxious and nuisance facilities are well documented, and public opposition often plays an important role in blocking or increasing the costs of siting plans. Some facilities, such as nuclear and other hazardous facilities, generate extremely high rates of opposition in the United States (see Kunreuther et al., 1990; Hamilton, 1993; Portney, 1985; O'Hare et al., 1983). To avoid the costs associated with neighborhood protests, some firms attempt to site facilities in neighborhoods where the probability of protest is lower. Hamilton (1993) reports that hazardous-waste companies have hired consulting firms to report on the demographics of target communities and even to survey target communities to assess the likelihood that local residents will protest facility siting. However, this is not true of all nuisance facilities, especially facilities that promote economic development. In fact, Coates et al. (1994) cite several instances in which communities volunteered to host low-level radioactive waste disposal sites. Despite potential support for a facility, the NIMBY (not-in-my-backyard) contingent frequently

carries the day. In this article, we present survey evidence that siting opponents are more likely to participate in collective action to achieve their goals.

Reviewing the literature, a striking feature of collective action is the strong role demographic characteristics play in explaining who will free-ride and who will act. Our results suggest that people who opposed the siting scenarios in our survey have higher incomes, have higher levels of education, are older, and are more certain of their answers than people who indicated that they would vote yes. The literature indicates that the people in our sample who say they would vote no have demographics that are similar to those of people who actually vote or engage in collective action.

If the opposition is more likely to actually vote against or protest the siting of the facility, then even if supporters are in the majority, it may still be difficult to site nuisance facilities. A small, active, voting opposition can present problems for companies and governments, and this effect will be exacerbated if the supporters of the siting plan tend to be less active or less likely to vote. Our research also implies that conducting opinion polls about support for a proposal may not accurately predict the actual level of public support encountered when the proposal is enacted if supporters suffer disproportionately from the free-rider problem.

If patterns of protest or voting do not accurately reflect the underlying preferences of the community, society may miss opportunities for siting or for lowering the cost of siting. Common political mechanisms like town meetings or official referenda may yield a biased view of a community's preferences. This research suggests that more accurate gauges of public opinion may reveal greater acceptance for siting. The research also brings into question the role of the political process in siting nuisance and noxious facilities. According to calculations in Coates et al. (1994), the current politically driven system for siting low-level radioactive waste disposal sites is neither equitable nor efficient. If political mechanisms designed to gauge support for siting public bads misrepresent the preferences of a community, it reinforces the need to think carefully about the role that politics plays in siting decisions.

Appendix A

Variable definitions, means, and standard deviations additional variables not defined in Table 4.

Variable	Definition (1 = not important, 7 = very important)	Mean (Standard Deviation)
Attitude variables:		
Crime	Reducing crime in this state	6.30 (1.44)
Animals	Protecting endangered animals in this state	5.05 (2.02)
Low tax	Finding ways to reduce taxes in this state	6.01 (1.56)
Demographic variables:		
Years in state	Number of years living in state	26.51 (16.33)
Retired	Dummy variable = 1 if retired, = 0 otherwise	0.08 (0.28)

Appendix A. (continued)

Variable	Definition (1 = not important, 7 = very important)	Mean (Standard Deviation)
Unemployed	Dummy variable = 1 if unemployed and seeking work, = 0 otherwise	0.05 (0.22)
Not work	Dummy variable = 1 if not seeking work, = 0 otherwise	0.06 (0.25)
Male	Dummy variable = 1 if male, = 0 if female	0.44 (0.50)
Survey dummy variables:		
S1V1	Dummy variable = 1 if survey 1 version 1, = 0 otherwise	0.19 (0.39)
S2V1	Dummy variable = 1 if survey 2 version 1, = 0 otherwise	0.18 (0.39)
S3V1	Dummy variable = 1 if survey 3 version 1, = 0 otherwise	0.18 (0.38)
S1V2	Dummy variable = 1 if survey 1 version 2, = 0 otherwise	0.05 (0.23)
S2V2	Dummy variable = 1 if survey 2 version 2, = 0 otherwise	0.07 (0.26)
S3V2	Dummy variable = 1 if survey 3 version 2, = 0 otherwise	0.05 (0.22)
S4V2	Dummy variable = 1 if survey 4 version 2, = 0 otherwise	0.04 (0.21)
S5V2	Dummy variable = 1 if survey 5 version 2, = 0 otherwise	0.07 (0.26)
S6V2	Dummy variable = 1 if survey 6 version 2, = 0 otherwise	0.07 (0.15)
S7V2	Dummy variable = 1 if survey 7 version 2, = 0 otherwise	0.04 (0.20)
S8V2	Dummy variable = 1 if survey 8 version 2, = 0 otherwise	0.04 (0.21)
Scenario 1 (Airport)	Dummy variable = 1 if scenario 1, = 0 otherwise	0.18 (0.38)
Scenario 3 (livestock farm)	Dummy variable = 1 if scenario 3, = 0 otherwise	0.18 (0.38)
Scenario 4 (Superfund)	Dummy variable = 1 if scenario 4, = 0 otherwise	0.18 (0.38)
Scenario 6 (radio tower)	Dummy variable = 1 if scenario 6, = 0 otherwise	0.18 (0.38)
Scenario 7 (landfill wall)	Dummy variable = 1 if scenario 7, = 0 otherwise	0.18 (0.38)
Scenario 8 (yard-waste burn)	Dummy variable = 1 if scenario 8, = 0 otherwise	0.09 (0.29)
Miami, FL	Dummy variable = 1 if survey conducted in Miami, = 0 otherwise	0.90 (0.29)
Tampa Bay, FL	Dummy variable = 1 if survey conducted in Tampa Bay, = 0 otherwise	0.08 (0.26)
Cary, NC	Dummy variable = 1 if survey conducted in Cary, = 0 otherwise	0.10 (0.30)
Greensboro, NC	Dummy variable = 1 if survey conducted in Greensboro, = 0 otherwise	0.55 (0.50)
Freehold, NJ	Dummy variable = 1 if survey conducted in Freehold, = 0 otherwise	0.08 (0.27)
Rochester, NY	Dummy variable = 1 if survey conducted in Rochester, = 0 otherwise	0.09 (0.28)

Appendix B

Random effects probit model results all variables coefficients and standard errors.

	Model (1)	Model (2)	Model (3)
Crime	0.04 (0.03)	0.04 (0.03)	0.04 (0.03)
Improve schools	− 0.05 (0.03)	− 0.05 (0.03)	− 0.05 (0.03)
Animals	− 0.02 (0.02)	− 0.02 (0.02)	− 0.17 (0.02)
Low tax	0.02 (0.03)	0.02 (0.03)	0.02 (0.03)
More industry	0.05 (0.02)	0.05 (0.02)	0.05 (0.02)
Own home	0.15 (0.09)	0.17 (0.17)	
Income	− 5.20E-06 (2.01E-06)		− 5.20E-06 (2.01E-06)
Income*own home		− 5.33E-06 (2.20E-06)	
Income*rent		− 4.67E-06 (4.08E-06)	
Cash*own home			0.25 (0.12)
Public good*own home			0.66 (0.21)
Cash*public good			0.60 (0.21)
Years in state	− 0.001 (0.003)	− 0.001 (0.003)	− 0.001 (0.003)
Male	0.04 (0.08)	0.04 (0.08)	0.04 (0.08)
Married	0.07 (0.08)	0.07 (0.09)	0.07 (0.08)
White	− 0.14 (0.14)	− 0.14 (0.14)	− 0.14 (0.14)
Black	− 0.14 (0.16)	− 0.14 (0.16)	− 0.14 (0.16)
Age	− 0.013 (0.004)	− 0.013 (0.004)	− 0.01 (0.004)
Beyond HS	− 0.20 (0.09)	− 0.21 (0.09)	− 0.21 (0.09)
Unemployed	− 0.24 (0.17)	− 0.21 (0.18)	− 0.24 (0.17)
Student	− 0.50 (0.23)	− 0.50 (0.23)	− 0.50 (0.23)
Other work	− 0.58 (0.24)	− 0.58 (0.24)	− 0.58 (0.24)
Not work	− 0.07 (0.16)	− 0.04 (0.16)	− 0.07 (0.16)
Retired	0.22 (0.15)	0.22 (0.15)	0.22 (0.15)
Survey time	1.13E-04 (4.74E-05)	1.13E-04 (4.75E-05)	1.14E-04 (4.76E-05)
Cash amount	7.30E-04 (2.75E-04)	7.30E-04 (2.75E-04)	7.22E-04 (2.75E-04)
Cash dummy	− 0.48 (0.19)	− 0.48 (0.19)	
S1V1	− 0.14 (0.25)	0.44 (0.25)	0.01 (0.23)
S2V1	− 0.11 (0.24)	0.47 (0.25)	0.04 (0.24)
S3V1	− 0.35 (0.26)	0.22 (0.26)	− 0.20 (0.23)
S1V2	− 0.74 (0.27)	− 0.74 (0.27)	− 0.59 (0.25)
S2V2	− 0.14 (0.23)	0.14 (0.24)	0.02 (0.24)
S3V2	0.26 (0.24)	0.26 (0.24)	0.41 (0.26)
S4V2	− 0.15 (0.27)	0.15 (0.27)	
S5V2	− 0.55 (0.25)	− 0.56 (0.25)	− 0.40 (0.23)
S6V2	− 0.33 (0.24)	− 0.32 (0.24)	− 0.18 (0.25)
S8V2	− 0.18 (0.27)	0.18 (0.27)	− 0.03 (0.23)
Airport	0.34 (0.13)	0.28 (0.16)	0.27 (0.16)
Livestock farm	0.20 (0.16)	0.14 (0.18)	0.14 (0.18)
Superfund		− 0.06 (0.16)	− 0.07 (0.16)
Radio tower	0.67 (0.12)	0.61 (0.16)	0.59 (0.16)
Landfill wall	− 0.05 (0.14)	− 0.11 (0.19)	− 0.12 (0.19)
Yard-waste burn	0.06 (0.16)		
Freehold, NJ	− 0.58 (0.20)		− 0.58 (0.20)
Cary, NC	− 0.28 (0.17)	0.29 (0.19)	− 0.29 (0.17)

Appendix B. (continued)

	Model (1)	Model (2)	Model (3)
Tampa Bay, FL	0.28 (0.18)	0.30 (0.20)	− 0.28 (0.18)
Miami, FL		0.27 (0.19)	
LL	− 870.43	− 868.95	− 869.54
N	1405	1405	1405

Notes

1. Host communities are commonly offered some type of compensation package, and law in several states mandates such packages. Compensation usually includes grants to the local government and reduced tipping fees in the case of landfills. Direct cash payments to individuals are not common, but payments to compensate for losses in property values have been used (Portney, 1985).
2. The full text of the survey is available from the authors.
3. While we attempted to downplay any health and safety risks associated with the scenarios, respondents may have brought their own preconceptions to the survey. In this study, we are more interested in who supported the siting packages rather than why.
4. The six cities were Cary, North Carolina (in the Raleigh-Durham area); Greensboro, North Carolina; Miami and Tampa Bay, Florida; Freehold, New Jersey (near New York City); and Rochester, New York. Subjects were chosen through a mall-intercept format to take a self-administered, computerized survey. Respondents had to be at least 20 years old and own or rent their own housing. Mall-intercept surveys have been shown to produce samples similar to telephone surveys. A summary of this literature can be found in Boyle et al., 1996, n. 9.
5. The data presented here are a subset of the data collected from the respondents. Two versions of the survey were administered. In the first version, administered in Greensboro, North Carolina, each respondent was asked to vote on nine scenarios, while the second version, administered in the other five cities, contained eight scenarios. In addition to scenarios that asked the respondent's willingness to accept the siting package, other scenarios asked the respondent to choose between two compensation packages or to choose between two houses with varying levels of property taxes and local public goods. In the first version of the survey, the order of the scenarios did not vary across respondents, but the type of question did. For example, scenario 1 was always the airport scenario, but one-third of the respondents were asked their willingness to accept cash compensation, one-third were asked their willingness to accept public-good compensation, and one-third were asked to choose between two houses located near airports. In the second version of the survey, the order of the scenarios and the question types were varied across respondents. The full survey is described in greater detail in Mansfield et al. (1998).
6. We also estimated a standard probit model with the data, and the results were qualitatively unchanged. All the variables had the same sign and general significance level.
7. Kahn and Matsusaka (1997) concluded that the environment seemed to be a normal good using data from voting on environmental referenda on the California ballot.
8. Mansfield et al. (1998) discuss evidence from this survey that public goods are preferred to cash as compensation even when cash might be preferred in a neutral market transaction.
9. We did not ask whether individuals would accept the facility if offered no compensation. Thus the finding that the dollar amount of the offer was positive does not contradict the result from Frey et al. (1996, 1997) and Kunreuther et al. (1990) that offering monetary compensation lowered or left unchanged support for the siting projects they investigated.
10. The specific question reads "How sure are you that you would vote (yes/no) if you faced this choice in real life?"

11. In probit estimates, certainty has a negative and significant coefficient. However, the variable is likely to be endogenous.
12. Using a z statistic to test for the difference between two proportions, the z statistic for the radio tower scenario was 4.62 and for the airport scenario it was 1.98.
13. The dependent variable, *support siting*, = 1 if yes and = 0 if no: *support siting* = 0.50 (0.02) − 0.07 (0.03) **vote* with the standard errors in parentheses.
14. Even greater differences exist in the area of campaign contributions.
15. Leaders in the Three Mile Island protest groups identified the sample of active protesters. Free-riders were identified through a general survey of the local population. Free-riders had similar opinions about Three Mile Island when compared to active protesters, but had not participated in any way in protesting the facility. For reasons discussed in the study, the authors focused on the opposition to the facility and not supporters.
16. With respect to cross-city differences, Oliver documents an interesting pattern in which the most and least affluent cities have lower participation rates than middle-income, economically diverse cities. However, the individual characteristics were still important and robust in explanatory variables.
17. The probabilities were calculated using the coefficients from the full model presented in the appendices. Aside from income, age, beyond high school, and student, all other variables were set at the mean values for the sample.

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