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PERCEPTION OF HAZARDOUS WASTE DISPOSAL FACILITIES AND RESIDENTIAL REAL PROPERTY VALUES

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and

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Abstract

Disamenities can affect the enjoyment of one's property. This loss is theoretically reflected in property values. If one is not aware of a disamenity, however, one does not discount values for it. A situation where perception of a disamenity rapidly developed was the publicity surrounding the Love Canal hazardous waste disposal site in Niagara Falls, NY during the summer of 1977. The effect of distance from the disamenity on real property values surrounding two hazardous waste disposal facilities is estimated for two upstate New York communities. The author concludes that publicity surrounding Love Canal did make a difference.

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Introduction

Public awareness of the problem of hazardous waste disposal as become increasingly keen. As a result, it has become virtually impossible to site new facilities. The reason for this is quite clear. While most recognize the need for safe, modern hazardous waste disposal facilities, nobody wants to be located near one. This situation is known as the NIMBY syndrome, for Not In My Back Yard.

While the underlying reasons for the NIMBY syndrome are numerous, and include considerations of health, aesthetics and general well-being, one objection to hazardous waste disposal facility siting frequently raised is the fear of loss of real property values by nearby residents. Changes in property values may reflect many different impacts of such a facility. The most frequently cited ones are health risk, noise, traffic and odors. Lower property values also mean lower property tax receipts for a community. While these contentions are frequently voiced in the hazardous waste facility siting literature, empirical evidence that locating a hazardous waste disposal facility automatically destroys property values in its immediate vicinity is scarce.

This paper seeks to assess whether the market for residential real property reflects the disamenity of living in

close proximity to a hazardous waste disposal facility. It also will examine the role played by the news media in creating awareness of disamenities, and if an event can change property values in locations removed from where the event itself took place.

The event considered is the publicity surrounding Love Canal. There is a great deal of controversy associated with the Love Canal incident, such as the extent of health risk, liability, and appropriate compensation of the victims. Newspapers, television, radio and magazines made Love Canal a household word synonomous with environmental disaster. While the site has contained hazardous waste since the 1940s, and health problems suspected to be caused by hazardous waste have been documented since the 1960s, it was not until the late 1970s that public attention was directed at the problem of hazardous waste in any large way.

One hypothesis is that this dramatic change in awareness should shift consumers tastes to not want to live near disamenities. A model of the land market is developed to evaluate this hypothesis.

Model Specification

There are two bodies of literature in economic theory which are relevant to the examination of this problem: externality theory and hedonic price analysis. The two have been combined in numerous studies. Ridker and Henning (1967), pioneered the

practice by examining the effect of air pollution on land values; Havlicek (1971) analyzed land values surrounding landfills. DeVany (1974) looked at how noise pollution from airports affected property values. The interpretation of such studies have been called into question by Freeman (1974) and others, but their impact on environmental economics has been important.

The reduced form was used to estimate coefficients for the different characteristics. Prices observed show where attribute bid and offer curves intersect. Structural equations separate the implicit markets for these attributes by mapping bid and offer curves. The principle reason for this was the lack of data for demand shifters, such as income and buyer's age. One cannot, with the reduced form, perform classical welfare analysis. (Rosen, 1974). However, one can test hypotheses of whether different attributes have measurably different coefficients. While this form is not as powerful as the bid-price method, it still yields meaningful results.

The prices of observed, arms-length residential real estate transactions were regressed against a set of variables which explained the value of the property. The variables estimated are as follows: ACRES, number of acres on lot; SFLA, square feet of living area; AGE, age of the house in years; STORIES, number of stories; ROOMS, number of rooms; BATHS, number of bathrooms; WATER, dummy variable: zero if private water supply, 1 if public. Let these characteristics be represented by X_i.

Estimation is undertaken in two steps. In the first step, the model is estimated with DISTANCE, the natural logarithm of number of feet from the center of the nearest hazardous waste disposal facility to the center of the property. The natural log was used because the marginal effect of the disamenity is expected to diminish with distance. A model of the residential real property market was used to estimate land values. Let PRICE = Price of the property; α = intercept, β_j = the marginal effect of amenity i; γ = the marginal effect of distance from the hazardous waste disposal facility; and e = the error term. The value of land can be expressed as:

$$\text{PRICE} = \alpha + \sum_{j=1}^{k} \beta_j X_j + \gamma_f \text{DISTANCE} + e \qquad [1]$$

The data are then separated into two groups: One which sold before the situation at Love Canal had received national publicity, and the other which sold after stories about Love Canal appeared in the national news. Love Canal became a major media event during the summer of 1977 (Brown, 1979). All property sold before June 1977 is in the BLC data set; all property sold June 1977 or later is in the ALC data set. For the second stage, the modethe β_j coefficients are constrained to the values estimated for the full time series. The model is then estimated separately for the two time series to see if publicity

made a difference in the effect on residential real property values. DISTBLC is the DISTANCE variable in the data set of sales before Love Canal; DISTALC is the DISTANCE variable in the data set of sales after Love Canal; γ_b and γ_a are the coefficients of distance before and after Love Canal. The models estimated are specified in equations 2 and 3.

$$\text{PRICE} = \alpha + \sum_{j=1}^{k} \hat{\beta}_j X_j + \gamma_a \text{DISTBLC} + e \qquad [\ 2a\ ]$$

$$\text{PRICE} = \alpha + \sum_{j=1}^{k} \hat{\beta}_j X_j + \gamma_b \text{DISTALC} + e \qquad [\ 2b\ ]$$

The hypothesis is that $\gamma_a > \gamma_b$. Because all of the other coefficients are constrained, the test between γ_b and γ_a is a paired t-test. The formula for comparison is (Snedecor and Cochran, 1980):

$$t' = \frac{(\gamma_a - \gamma_b)}{\sqrt{\frac{s_a^2}{n_a}} + \sqrt{\frac{s_b^2}{n_b}}} \qquad [\ 3\ ]$$

The test is declared significant at 1% if $t' > t(d.f.)$. The appropriate t for both sites is approximately 2.60.

Case Studies

Two sites were selected for the study: one off-site, the other on-site. The sites chosen reflect criteria necessary for testing the central hypothesis of the study. Both were in towns where real property data were readily available, and both had active TSDFs during the period examined. Baker (1982) contains more information about the sites chosen for this study, and for a landfill which was not included in this study.

The off-site facility is owned and operated by SCA Services Corporation and is located in the Town of Porter, in Niagara County north of Niagara Falls. It has been under commercial management since 1971. The on-site facility is owned and operated by the General Electric Corporation, and is located in the Town of Waterford, in Saratoga County north of Albany. Both sites contain wastes classified as hazardous under the Resource Conservation and Recovery Act, and both were in operation during the period of study.

The SCA site is a modern hazardous waste treatment, disposal and storage facility (TDSF) which is registered with the U.S. Environmental Protection Agency and N. Y. State Department of Environmental Conservation to legally dispose of hazardous waste. It is one of two such off-site facilities in the state. This narrowed down the prospective case studies greatly, because legal

disposal was of interest, rather than orphan dumpsites, where the selection is wider. The Porter site was selected over the only other alternative which met the criteria, the CECOS International site in Niagara because of fewer confounding effects.

The GE site is less modern, but has since constructed a rotary kiln for incineration of hazardous waste. There were a larger number of on-site facilities to choose from than off-site facilities. The site in Waterford was chosen mainly for the quality of land market data which could be obtained.

With an off-site facility, the hypothesis is that land values are affected by hazardous waste disposal only. With an on-site facility, there are other attributes of the facility which confound the dissection of land values. Proximity to a major employer may enhance residential real property values; other externalities such as air, noise and water pollution may detract from the value of land.

Porter

Ordinary Least Squares is used to fit the models. The first form estimated is model of the Porter site. The results of this model are presented in table 1. There were 73 observations in the Porter site, 15 before June, 1977 and 58 after June, 1977. Price was deflated to 1974 dollars using the CPI shelter component for the Buffalo SMSA, which includes Porter.

Table 1
Estimated Coefficients for the Porter Site

Variable	Coefficients	Deviation	t-statistics
INTERCEPT	4,827.86	10,392.20	0.47
ACRES	17.89	4.24	4.21
AGE	-75.09	26.37	-2.85
SFLA	13.11	2.97	4.41
STORIES	-232.38	223.50	-1.04
ROOMS	-2,243.66	959.11	-2.34
BATHS	5,382.37	2,063.50	2.61
WATER	12,837.40	4,454.88	2.88
DISTANCE	4,653.00	1,948.81	2.39
DISTBLC	-8,203.63	11,816.75	-0.69
DISTALC	6,846.86	3,265.85	2.10

$R^2 = 0.60$ $\quad \bar{R}^2 = 0.55$

$F = 13.60$ $\quad t' = 4.88$

The typical house in this sample was on a lot of about 1.8 acres, was about 37 years old, had about 6 rooms, more than one bathroom and more than one story over about 1447 square feet of living area and was on a public water supply. The average distance from the SCA site was 9.6 thousand feet.

The negative coefficient for distance on sales before June, 1977 is somewhat surprising. Regression diagnostics using partial leverage plots showed the sign to be caused by a couple of influential outliers. Removing those observed sales made the

sign for the DISTBLC coefficient positive, but small. In either case, the t-statistic for distance before Love Canal is not significantly different from zero. The t-statistic for distance after Love Canal is significant. The typical house one mile away in this case would, after Love Canal, go for about $38,834; two miles away, $43,580.

Waterford

A similar model was fit for the Waterford site. Price in this case was deflated by the Construction Review index for the Northeast. This sample contained 96 sales: 38 before June 1977 and 58 during or after June 1977. The results for the Waterford site are presented in table 2.

The typical house in the Waterford sample was on less than half an acre lot, was 18 years old, had one story and one bathroom out of 6 rooms, in an area of less than 1300 square feet. The average distance from the G.E. plant was about 6,000 feet.

Table 2
Estimated Coefficients for the Waterford Site

Variable	Coefficients	Deviation	t-statistics
INTERCEPT	7,515.56	6,374.21	1.18
ACRES	1.21	1.30	0.57
AGE	-121.38	25.01	4.85
SFLA	5.51	1.49	3.68
STORIES	-122.36	168.23	-0.72
ROOMS	-680.85	789.66	-0.86
BATHS	1,351.61	972.20	1.39
WATER	2,411.00	2,451.84	0.98
DISTANCE	3,017.40	1,525.73	1.98
DISTBLC	252.25	2,396.04	0.11
DISTALC	2,398.18	1,717.20	1.40

$R^2 = 0.48$ $\bar{R}^2 = 0.43$

$F = 10.41$ $t' = 4.58$

Neither the t-statistic for distance before or after Love were significantly different from zero. However, when the pooled t-test is used, the two γs are significantly different from each other. The average house one mile away after Love Canal would have an expected price of $16,400; the same house two miles away would be expected to sell for about $18,000.

Conclusions

The presence of hazardous waste disposal facilities has a measureable impact on property values. In both cases, the coefficients for distance after Love Canal were significantly greater than the coefficients for distance before Love Canal.

Because prices were deflated, this should not reflect any upward trend in prices. There is also no apparent reason to doubt the assumption that structural change took place with the other variables. The standard deviations for the distance coefficent was greater in the sales before June 1977.

Therefore, the models of the land markets around these sites show that before Love Canal, distance from local hazardous waste disposal facilities made little difference. After the publicity surrounding that particular hazardous waste facility, distance from a hazardous waste disposal facility became an important factor in selecting residential real property. This was true whether the disposal facility was located on-site or off-site.

This shift in consumer preferences is consistent with increased citizen opposition to locating new hazardous waste disposal facilities. It also justifies some of the contentions that being located near a hazardous waste disposal facility lowers property values. The way the model is specified, however, the correct interpretation is that real property located further away from a hazardous waste disposal facility is worth more. The differences between the two sites also showed the idiosyncrasies of the local land markets. This suggests that there is no single value which can be used to estimate property value impacts when siting hazardous waste disposal facilities.

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