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Landfill Closure and Housing Values

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ABSTRACT

The United States disposes roughly 60% of the municipal solid waste it generates each year in solid waste disposal facilities, commonly known as landfills. Hedonic pricing studies have estimated the external costs of landfills on neighboring housing markets, but the literature is silent on what happens to property values after the landfill closes. Original housing price data collected both before and after a landfill closure are used to estimate how a landfill closure affects neighboring property values. Results of both a hedonic pricing model and repeat-sales estimator are used in the analysis.

1. Introduction

The United States disposes roughly 60% of the municipal solid waste it generates each year in solid waste disposal facilities, commonly known as landfills. But landfill use has been found to generate external costs. Using plausible assumptions about the number homes located within close proximity of the landfill, the value of those homes, the quantity of annual waste deposited at the landfill, and the discount rate, Defra (2004) estimates the external cost of landfill disposal are between \$3.05 to \$4.39 for each compacted ton disposed over the lifetime of the landfill. Implicit to this calculation is the assumption that the reduction in housing values is permanent. That is, external costs of landfill disposal are generated even after the landfill ceases to accept waste and closes the site.

This paper questions this assumption by estimating whether the closure of a solid waste landfill improves neighboring property values. Neighboring property could remain low if potential home buyers either fear a containment breach would emit odor and toxins into the air and water or simply find the oddly shaped grass covered hill unattractive. Property values could instead improve with the reduction of garbage trucks on local roads or the elimination of odor permeating from the open face of an open landfill. If property values increase with the closure of a landfill, then estimates of the external marginal cost of landfill disposal such as in Defra (2004) would necessarily decrease. Efficient solid waste and recycling policies derived in the literature such as optimal waste taxes or recycling subsidies would be affected.[1]

[1] See Kinnaman and Fullerton (2000) for a review of the economics literature on optimal solid waste and recycling policy.

The next section of this paper develops the theoretical structure necessary for estimating housing values as a function of a landfill closure. Housing price data collected both before and after a landfill closure are described in Section 3. Section 4 reports results of this analysis, where a landfill closure is estimated to improve neighboring property values by 10.8%, although this estimate is not statistically different from zero. The repeat sales estimator used on the same data suggests resales that straddle the landfill closure increase relative to resales that did not. Section 5 concludes by discussing the policy implications of these results.

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2. A Model of Housing Demand

Following the logic of Lancaster (1966) and Rosen (1974), assume residents gain utility from consumption (C) and housing services (**H**) according to the utility function

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(1) $$U = U(C, \mathbf{H}),$$

where **H** is a vector of N individual housing attributes $\mathbf{H} = \mathbf{H}(q_1, \ldots, q_N)$ including the geographical distance to a solid waste landfill, structural attributes, and other neighborhood attributes.

Assume residents are endowed with income Y. Residents maximize utility subject to the budget constraint

(2) $$Y = C + P(\mathbf{H_i}),$$

where the price of the composite good is normalized to one, and $P(\mathbf{H_i})$ is a hedonic price function of the N housing attributes (i = 1,…,N).

Residents maximize utility (1) subject to the budget constraint (2) by choosing optimal quantities of the composite consumer good and each of the N housing attributes. The first-order condition for each housing attribute can be simplified to

(3) $$P_{Hi} = (U_{Hi}/U_C) \qquad \text{for } i = (1, \ldots, N)$$

where subscripts are used to denote partial derivates. The individual chooses each housing attribute, including the distance from a solid waste landfill, such that the implicit price of that housing attribute is equal the marginal rate of substitution between that housing attribute and the composite good. The closing of the landfill could decrease the marginal utility of increasing distance from the landfill, and therefore decrease the marginal rate of substitution between distance to the landfill and the composite good. If so, households would choose to locate closer to the landfill and therefore bid up housing prices within close proximity to the landfill.

Two econometric models are available to estimate the implicit price of remoteness from a landfill. The first is the hedonic pricing model. Assume the supply of housing within a given proximity to a landfill is fixed at $Q_S = \pi_{10}$. Assume the demand for such housing is a function of the price of housing (PRICE), whether the landfill is open or not (OPEN DUMP), the distance to the landfill (DISTANCE), an interaction term (OPEN DUMP*DISTANCE), other physical and neighborhood attributes (**X**), and the calander year (YEAR),

(4) $$Q_D=\pi_{20} + \pi_{21}\text{PRICE} + \pi_{22}\text{OPEN DUMP} + \pi_{23}\text{DISTANCE} + \pi_{24}\text{DISTANCE*OPEN DUMP}+\pi_{25}\text{YEAR} + \boldsymbol{\pi}\mathbf{X}+\varepsilon,$$

where the π's are structural coefficients. The housing market is in equilibrium when the quantity supplied (Q_S) is equal to the quantity demanded (Q_D), resulting in

$$(5) \qquad PRICE = \beta_0 + \beta_1 OPEN\ DUMP + \beta_2 DISTANCE + \beta_3 DISTANCE*OPEN\ DUMP + \beta_4 YEAR + \boldsymbol{\beta X} + \mu$$

where the β's are reduced form coefficients to be estimated, and μ is the error term with zero mean and constant variance σ^2_μ. The error term includes unobserved variables affecting housing prices but uncorrelated with the included variables, such as the health of the macro economy.

Based on the model above, β_1 will be negative if closing the landfill improved property values. A positive value on β_2 could reflect a long-term stigma associated with a property's proximity to the closed landfill. The coefficient on the interactive term (β_3) estimates the effect of distance from the open landfill (∂ PRICE/∂OPEN DUMP = β_1 + β_3OPEN DUMP). If β_3 is positive, then the negative effect on property values from the open landfill decreases with distance to the landfill.

The open landfill's effect on neighboring property values can also be estimated using data on repeated sales. The repeat sales estimator, introduced by Bailey et al. (1963) and refined for estimating the effect of a change in environmental quality by Palmquist (1982), does not require data on individual attributes of each housing unit, but one must assume that the unobserved characteristics of each housing unit (other than age) do not change significantly between sales.

As in Bailey et al. (1963), the natural log of the ratio of the selling price and the buying price of each repeated sale can be regressed on a constant, a dummy variable indicating whether the landfill closed within the duration of each repeated sale (CLOSURE=1), and a dummy variable representing each year in the sample. The value of each of these yearly dummy variables is -1 if the housing unit was purchased within that year, +1 if the housing unit was sold during that year, and zero otherwise. One advantage of the repeat sales estimator is that it controls for periods of relatively fast and slow growth in housing prices.

3. The Data

Data on housing values and attributes both before and after the closure of a neighborhood landfill are obtained from all residential properties within the incorporated borough of Lewisburg, Pennsylvania. Lewisburg is a small town located along the Susquehanna River in central Pennsylvania. Downtown Lewisburg is comprised of single and semi-attached units of Federal and Victorian architecture built on small lots in rows between 1825 and 1925. Few apartment buildings are located in downtown Lewisburg, although some dwellings have been sold with adjoining units, and some detached units have been divided into two or more apartments. The Susquehanna River borders Lewisburg to the east and Buffalo Creek, a major tributary to the river, borders Lewisburg to the north. Bucknell University borders Lewisburg to the south, and Route 15, the only major north/south artery through central Pennsylvania, borders Lewisburg to the west. Low density suburban neighborhoods are located west of Route 15. The land directly to the south of Bucknell University is devoted to agriculture as is the land north of Buffalo Creek. A photograph of downtown Lewisburg with these borders is provided in Figure 1. The single-line branch railroad track shown on the photograph is no longer in use, nor was railroad traffic along these branch lines historically heavy.

Although small in size, this community has some rather unique qualities for estimating the *ceteris paribus* effect of a landfill on property values. First, other neighborhood amenities believed to affect property values such as the quality of schools, crime rates, and proximity to highways or industrial areas are essentially constant across the data. Second, the bounded downtown area is constrained in size as described above and was fully developed by 1957 when housing data is made available for the purposes of this study. Thus, the supply of housing is held constant throughout the duration of the data, eliminating the simultaneous equations bias inherent to many hedonic pricing studies. Third, although the landfill grew over time as waste was deposited, the size of the property originally allocated to the landfill remained constant throughout the duration of the housing data. The site presently takes the appearance of a large grassy mound with a flat top that rises roughly 15 feet above the surrounding terrain. A municipality drop-off recycling facility and a brush pile have been constructed on the property. Very little landscaping has been added.[2]

Housing attributes and sales prices for 290 dwellings located in downtown Lewisburg were obtained from the Union County tax assessment office. The sales price was obtained each time each property was transferred between 1957 and 2005, thus the entire population of home sales in the incorporated borough of Lewisburg is included in

[2] Rustic softball fields have been developed and gravel roads provide access to the brush piles. Hite et al. (2001) find that proximity to parks improves property values in urban areas. Anderson and West (2005) and McConnell et al. (2005) also find that urban households value open spaces. Irwin (2002), Bolitzer and Netusil (2000), Lutzenhiser and Netusil (2001) and Smith et al. (2002) also find that proximity to open spaces increases property values.

the study. The number of entries per property is equal to the number of times that property was sold, yielding 711 total observations. Housing transactions made not at arms length, such as the addition of a second name on a deed, are usually recorded as a $1 sale by the assessment office and were removed from the sample.

The structural and neighborhood attributes identified for each dwelling are defined in Table 1. Physical characteristics obtained for each housing unit include the size of finished living area, the number of bathrooms, and the number of fireplaces. Property characteristics include the total acreage of the property, the number of garages, and indications for whether the property is a duplex (one of two independently owned halves of a single housing structure), and is on the 30-year flood plain. The geographical distance along established roads between the edge of the landfill and the front of each property is also obtained for each housing unit.[3] Observations were obtained over two regimes. The first regime, prior to 1976, consisted of all houses sold in downtown Lewisburg while the landfill was open and operating. The second regime denotes houses sold after 1976 when the landfill was closed.[4] The estimation below contains a time trend variable (YEAR) to control for the effects of gradual increases in property values attributable to changes in the general population and other time-dependent variables. Even though the data contain several historical price observations for each housing unit, structural characteristics are observed only once and reflect the current (2005) state of the housing unit. This data limitation may not be problematic because the Lewisburg

[3] The linear distance to the landfill would better capture the effects of odors and blowing trash than the distance along established roads. But data on the linear distance of each property in the sample is not available.
[4] According to local newspapers from 1976, the landfill closing was announced in four months before the actual closing. Only seven properties exchanged hands between announcement and closure, insufficient data to estimate whether property values changed gradually between the announcement and the closure. All properties sold after the announcement were treated as post-closure sales.

housing stock was originally constructed in the 19th and early 20th century on very dense (townhouse) lots. Although renovations are likely, major additions are difficult to construct.

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Means and standard deviations of each attribute are provided in Table 2. The average unit sold for just over $50,242 (in 1993 dollars). The minimum purchase price of $1,000 occurred in 1973 for a small plot of land with a trailer. The distance to the landfill varies between 0.04 and 1.03 miles and averages 0.50 miles. The average property contains 2,001.84 square feet of living space with roughly 1.58 baths. As mentioned above, the average lot size is small at 0.16 acres. The largest property is an outlier at 5.39 acres (mostly wooded along the river), 94.7% of properties fall within 0.03 to 0.25 acres. 17% of properties are duplexes, and 50% are in the 30 year flood zone. Although the variation in some independent variables is large, the downtown area is rather homogeneous when it comes to neighborhood effects. Large homes with fireplaces are just as likely to be adjacent to small homes without garages as they are to other large homes.

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An important variable missing in the data is the physical quality of each housing unit. Obviously, units that have fallen into disrepair would sell for less than units that have been well maintained, *ceteris paribus*. Leaving this variable in the error term may bias the coefficient on distance to the landfill only if the quality of housing close to the landfill is systematically of lower quality than housing farther from the landfill. The year each dwelling was built is observed but does not serve as a suitable control for quality because (1) this variable does not vary significantly across the sample, and (2) some of the older homes have been best preserved. Instead, the number of fireplaces serves as an admittedly imperfect but nonetheless useful proxy for the quality of each housing unit. Working fireplaces were originally constructed in virtually all housing units in downtown Lewisburg. Maintaining fireplaces and especially the chimneys is expensive and sometimes unnecessary as central heating systems have improved. To avoid maintenance costs, some homeowners have chosen to cover fireplaces with plaster or wallboard. Only 23.2% of housing units in downtown Lewisburg currently feature working fireplaces. Although one property features 9 working fire places, 90% of those properties with fireplaces have only one or two. That these homeowners have preserved fireplaces and chimneys could also suggest the home is well maintained.

4. Empirical Results

a. Hedonic Regression Results

The log of the sales price of each house was regressed on the physical and neighborhood attributes of that house and a time trend variable. Table 3 provides the hedonic OLS results. Closing the landfill is estimated to increase property values by 10.8%, but this estimate is not statistically different from zero at any acceptable confidence level. Property values are estimated to increase by 34.0% for each mile of distance between that property and the landfill, regardless of whether the landfill was open or closed. The coefficient on the interactive term is not statistically significant, thus proximity to the operating landfill was no better or worse for property values than proximity to the closed landfill. That property value increase with the distance from even a closed landfill could suggest the presence of a market stigma associated with the closed landfill site, also found in McCluskey et al. (2003) and Kiel and Williams (2007) for hazardous waste sites.

Although the literature is silent on the effects on housing prices from a landfill closure, many have estimated how an operating landfill affects neighboring property values. Havlicek, Richardson, and Davies (1971) use data from 182 home sales between 1962 and 1970 to estimate housing prices increase by $9,800 per mile of distance from a single landfill. Gambler *et al.* (1982) utilize a price survey of 137 house sales between 1977 and 1979 to estimate values increase by 5%-7% per mile of distance from a single landfill. Havlicek (1985) uses data on housing prices around five landfills to estimate housing prices rose 5% with each mile of distance from a landfill. More recently, Nelson *et al.* (1992a), Nelson *et al.* (1992b) and Nelson *et al.* (1997) use local housing data to estimate each mile of distance from a landfill increases property values by 6 to 8%.

Others have studied the long term effects on property values from proximate location to a hazardous waste disposal facility. For example, Kohlhase (1991) finds that the loss in property values for homes within close proximity of an announced Superfund site is eliminated once the cleanup is finished. But McCluskey et al. (2003) show that properties located within 1.2 miles of a hazardous waste site decrease both before and after remediation, suggesting the presence of a long-term stigma. Kiel and McClain (1996) estimate that merely proposing a hazardous waste site negatively affected property values, but only in the short run, suggesting no long-term stigma associated with a site.

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That property values are estimated here to increase by 34.0% for each mile in distance from the landfill, an estimate greater than that achieved by the previous literature, could be attributable to the fact that all data gathered for this study are within

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one mile of the landfill.[5] Many other studies considered a wider range of data, and some have found the effect of distance on property values decreases with distance from the landfill (see Defra, 2004, for a thorough examination of this literature).

The regression controlled for other factors thought to affect the sales price of housing. The coefficient on the YEAR variable suggests real housing values improved by an average of 1.9% per year over the duration of the sample. A 1% increase in the square footage of the housing unit increased by 0.461% percent the sales price of the housing unit. A full bathroom increases the price by 17.3%, and a garage by 17.2%. Duplexes are worth 23.8% less than detached housing units with comparable characteristics and units on the flood plain are worth 12.7% less than non flood plain homes. The coefficient on RIVER suggests a river view increases property values by 20.1%. This result could be compared to Pearson et al. (2002), who estimate that even a partially obstructed view of a public park or ocean increases property values by 6-7% but proximity without such a view did not increase values.

As discussed above, the number of working fireplaces could work as a useful proxy for housing quality in these data. A fireplace is estimated to increase the price of a home by 15.7%. In a thorough review of the hedonic pricing literature, Sirmans and Macpherson (2003) identify 43 empirical papers that have estimated the effect of a fireplace on housing value. The average coefficient across these 43 studies was 0.0427, less than a third of the present estimate of 0.148. Because many of the 43 studies presumably used modern homes or an age variable to control for quality suggests perhaps that the actual market value of a fireplace in a $100,000 home is $4,270. That the present

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[5] Although Kiel and Williams (2007) suggest the effect of hazardous waste sites on property values can vary across sites.

estimate is much larger suggests the fireplace variable may be controlling for more than just the marginal value of a fireplace, but perhaps also the overall quality of the home.

Controlling for housing quality is a challenge to all hedonic estimations. If working fireplaces serve as a poor proxy of housing quality, then the coefficient on DISTANCE provided above is biased in the upward direction if housing quality is positively correlated with distance to the landfill. Some portion of the estimated increase in property values within two miles of the landfill could be attributable to simultaneous improvements in housing quality rather than added distance from the landfill.

B. The Repeat Sales Estimator

The repeated sales estimator generates an unbiased estimate of the effect of the landfill closure on property values assuming the quality of the house remains constant between each sale. There were 369 repeated sales in the data. 10 of these repeated sales occurred entirely before the landfill closed in 1976, 235 occurred entirely after, and 124 repeated sales straddled the landfill closure. The natural log of the ratio of selling price to buying price varied from 1.005, 1.273, and 0.423 for those repeated sales that occurred before, during, and after the landfill closure, respectively.

Results from the repeat sales estimator are provided in Table 4. The year 1993 was eliminated from the regression to eliminate perfect collinearilty with the constant term. The coefficient on CLOSURE is positive and statistically significant at the 5% level. The coefficient suggests that the natural log of the ratio of the selling price to the buying price increased by 0.846 if the purchase occurred while the landfill was open and the sale occurred after the landfill was closed, relative to repeated sales that occurred before or after 1976. Thus, if the sales price of a property was to increase by, say, 1.9% per year (the average real increase per year) with no change in landfill status, then the price of the property would increase by 3.51% per year (a 84% increase) if the resale occurred after the closure.

The estimated coefficients on the dummy variable for each year can be used to construct a local housing price index. This index is presented in Table 5, where 1993 is the base year when the index takes on a value of 100. The year of the landfill closure in 1976 is indicated by the vertical black line. The index suggests housing prices in downtown Lewisburg have increased, albeit unsteadily, between 1957 and 2005.

5. Conclusions and Policy Implications

Housing data gathered before and after the closure of a solid waste landfill suggest property values increased by an estimated 10.8% with the closure of a solid waste landfill, but this estimate in not statistically significant. The repeat sales estimator suggests the landfill closing improved the ratio of sold price to purchased price by 0.84%. Finally, property values continued to rise with distance from the open or closed landfill, suggesting a potential stigma effect associated with the old landfill site.

Previous estimates of the external costs of landfill disposal are overstated to the extent these result suggest closing the landfill improved property values. The decrease in property values attributable to an operating landfill is at least partially restored once the landfill closes. A simple model serves to illustrate the magnitude of this overstatement of the external costs of garbage disposal. Assume n identical housing units each worth \$v are located within equal proximity to a newly constructed landfill. Once under operation, assume the landfill reduces the value of each housing unit by p, where $0<p<1$. Thus, the landfill reduced the value of the housing stock by p*n*v. Assuming each dollar of housing stock generates $h in annual housing services (or, rental income), thus the landfill reduced the value of annual housing services by h*p*n*v. If this loss in housing services were expected to continue indefinitely, then the net present value of all future losses in housing services is h*p*n*v/r, where r is the social discount rate. Divide this figure by the total amount of garbage disposed over the lifetime of the landfill to get the *average* external cost, which is assumed for convenience to be constant and therefore equal to the marginal external cost.

But if this loss is only expected to continue for the 20-year life of a landfill at which time the value of each housing unit returned to its original level, then the net present value of all future losses in housing services is given by h*p*n*v*[1-(1-r)^$^{-20}$]/r. Divide this figure by the total amount of garbage disposed to obtain the average and therefore constant marginal external cost of disposing waste in a landfill. The ratio of the latter figure to the former figure is [1-(1-r)^$^{-20}$]. If r = .05, then the ratio of the marginal cost of garbage disposal with only 20 years of harm to households to that of infinite harm to households is 0.623. Under these assumptions, previous estimates of $3.05 to $4.39 per ton (DEFRA) can be reduced to $1.90 to $2.73 per ton. Efficient policies described in the economics literature such as disposal taxes, recycling subsidies, and deposit-refund rates are dependent on the external marginal cost of solid waste disposal and would therefore fall. This reduction is mitigated if housing values only partially recover to $v once the landfill closes. If, say, only half of the original loss in value is returned at closing, then the ration is .812.

Most solid waste generated today is disposed in large regional disposal facilities developed in response to Subtitle D of the Resource Conservation and Recovery Act (RCRA) of 1976, which imposed technology-based standards on the construction, operation, and closure of landfills. These standards caused the fixed costs of landfill construction to rise significantly. Economies of scale became necessary to recover these fixed costs, and new landfills grew taller, covered greater areas, and served large regions rather than single municipalities.[6]

How applicable are these results to studying property values around large regional landfills? We will not know for some time. The first of these regional landfills scheduled to close are the Fresh Kills landfill on Staten Island and the Tullytown landfill in Pennsylvania. But after-closure housing price data will not be available for several years. In anticipation of obtaining those data, several qualitative differences between the landfill studied here and a post-RCRA facility can be identified. First, the grass mounds at the Fresh Kills and Tellytown facilities are demonstrably larger than the 15 foot height achieved by the Lewisburg landfill, making the subsequent development of open space for public use virtually impossible. Second, although thousands of properties are located within eyesight of the Tullytown facility, zoning set backs required by RCRA imply fewer housing units will be located within the close proximity observed in the Lewisburg data. Third, leachate collection systems are more advanced in post RCRA landfills, and hence the threat of post-closure contamination is reduced. Thus, the effect on property values from a post RCRA landfill closure could be quite different to results obtained in

[6] Throughout the late 1970's and early 1980's, the number of landfills operating in this country decreased by roughly 500 per year even as disposal capacity remained steady or increased.

this study. Nonetheless, the results obtained here could serve as useful benchmarks to such future studies.

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Figure 1: Map of Study Area

Table 1: Definitions of Housing Attributes

Endogenous Variable	
LN (price/cpi)	The log of the nominal sales price of the housing unit divided by CPI
Exogenous Variables	
DISTANCE	The distance (in tenths of miles) along established roadways between the front of the housing unit and the edge of the university
DUMP OPEN	1 = The housing unit sold before 1976 while the landfill was open 0 = The housing unit sold after 1976 while the landfill was closed
LN (square feet)	The natural log of finished living area (floored and heated)
BATH	The number of bathrooms. A full bathroom is one with a toilet, shower, and sink, while a half bathroom generally has a toilet and a sink.
GARAGE	The number of garages on the property. A garage is defined as a building either attached or detached from the house that can store at least one car.
DUPLEX	1 = The housing unit is attached to another housing unit 0 = The housing unit is detached from another housing unit
ACRES	The number of acres of land that the unit is built on and that would be included in the sale and purchase of the unit.
FLOOD	This variable describes whether or not the unit is located on what the government has labeled a flood plain. Houses on the flood plain are at a higher risk for damages by flooding of rivers or creeks (in this case the Susquehanna River or the Bull Run Creek) than those that are not on a flood plain. 1 = The housing unit is located on the 100 year flood plain 0 = The housing unit is not located on the flood plain
FIREPLACE	The number of fireplaces in the unit.
YEAR	The calendar year the property sold

Table 2: Descriptive Statistics

	Minimum	**Maximum**	**Mean**	**Standard Deviation**
PRICE	1,485	596,862	50,242	36,205
DISTANCE	0.4	1.03	0.50	0.28
DUMP OPEN	0	1	0.25	0.43
SQUARE FEET	702	5,732	2001.84	782.32
BATH	1	4	1.58	0.60
GARAGE	0	3	0.54	0.51
DUPLEX	0	1	0.17	0.37
ACRES	0.03	5.39	0.16	0.291
FLOOD	0	1	0.50	0.50
FIREPLACE	0	9	0.33	0.77
YEAR	1957	2005	1984.32	12.51

Table 3: Hedonic regression Results (Dependent variable = LN (Price))

Variable	**Coefficient**	**Standard Error**	**Significance**
DUMP OPEN	-0.108	0.104	-
DISTANCE	.340	.077	1% level
DUMP OPEN * DISTANCE	-0.127	0.151	-
Structural Characteristics			
LN(Square feet)	0.461	0.068	1% Level
BATH	0.173	0.039	1% Level
GARAGE	0.172	0.036	1% Level
DUPLEX	-0.238	0.053	1% Level
ACRES	-0.213	0.064	1% Level
FLOOD	-0.127	0.039	1% Level
FIREPLACE	0.157	0.026	1% Level
RIVER	0.201	0.099	5% Level
YEAR	0.019	0.002	1% Level
CONSTANT	-35.721	4.768	1% Level

N = 711; R^2 = 0.417

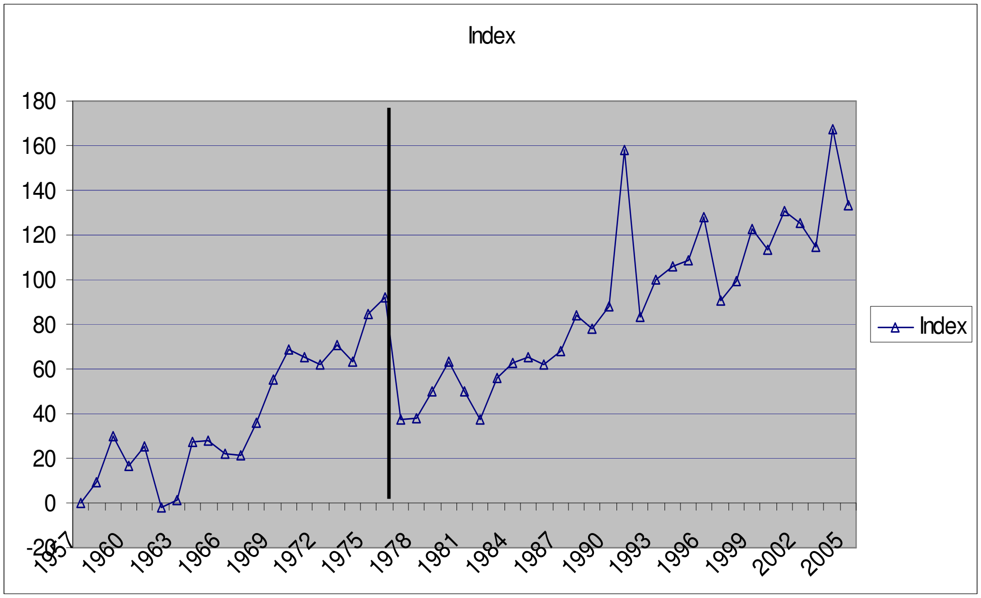
Table 4: Repeat Sales Estimator Results (Dependent Variable = $\log[Y_{2i}/Y_{1i}]$, where the Y's represent the sale prices in periods 1 and 2)

Variable	Coefficient	Standard Error	Significance
1957	-1.590	.543	1% level
1958	-1.444	.509	1% level
1959	-1.113	.520	1% level
.	.	.	
.	.	.	
.	.	.	
2003	0.233	.218	-
2004	1.074	.401	1% level
2005	0.530	.272	10% level
CLOSURE	0.846	.444	5% level
Constant	0.031	0.047	-
N = 369; R^2 = .634			

Note: The year 1993 was eliminated from the regression.

CLOSURE variable = 1 if house was bought while landfill was open and sold when landfill was closed, = 0 if house was both bought and sold while landfill was open (pre 1976), or both bought and sold while landfill was closed (post 1976).

Table 5: The Repeat Sales Estimated Housing Price Index



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