

**The Brownfields Reality Check: A Study of Brownfields
and Section 8 Households in Cleveland, Ohio¹**

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Introduction

Blighted neighborhoods are communities where disinvestment has left behind a landscape of abandonment and decreasing property values where only the lowest income residents remain. The literature has demonstrated the income concentration effects of concentrated low income housing in these blighted neighborhoods (please see Galster 1987; Goldsmith and Blakely 1992; Rusk 1993; Downs 1994; Abramson, Tobin et al. 1995; Galster 1998; Keating 1999; Pendall 2000 for some examples of the discussion). Additionally, these same neighborhoods are often the locations of the highest concentrations of brownfields, and due to their effect on an

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already depressed real estate market, these brownfields typically remain contaminated and undeveloped. Several authors have demonstrated the depressed nature of housing prices in neighborhoods with brownfields (Patchin 1988; Patchin 1991; Mundy 1992; Mundy 1992; Chalmers and Roehr 1993; Patchin 1994) and the concentrated nature of brownfields in predominantly minority, low-income neighborhoods (Leigh 1996; Leigh and Coffin 2000). Thus, we know that blighted neighborhoods typically provide the only housing options for many low-income residents in the inner city and we know that these same neighborhoods have high concentrations of brownfields. However, it is not clear whether the brownfields, with their negative effect on housing prices, are affecting low-income residents. Do these neighborhoods limit the lowest income residents to living situations where brownfields also exist?

This research addresses the relationship between brownfields and Section 8 households, representing a subset of low-income residents, in a way that views two Federal policies, brownfields and affordable housing, through one lens. It examines the patterns of Section 8 households in neighborhoods where brownfields are located to see how the added spectrum of brownfields impacts this underserved population. My hypothesis is that the lowest income residents of most central cities are being affected by the lack of decent affordable housing AND brownfields. Then, given the negative effect of brownfields on property values and the lack of decent affordable housing in central cities (USHUD 1999), the lowest income residents of the inner city are facing even greater limits in their housing choices. Thus, they are potentially being forced in increasing numbers to substandard housing in contaminated neighborhoods, further reducing their economic opportunity. This research focuses on the stigma effects of

brownfields, considering how contamination stigma affects the overall economic well being of the lowest income residents of distressed communities. Based on the findings from this research, I will demonstrate that Federal housing policies need to add brownfields to the equation when developing strategies for moving high need households to better housing as a means to increase access to brighter economic opportunity.

The Policy Issue

Demand drives real estate development decisions and brownfields are no different. A brownfield in a prime location will be redeveloped. Those brownfield properties that are located in current industrial corridors or redeveloping commercial centers are situated on attractive parcels of land. They have great infrastructure and access to markets. Some have questioned whether these properties are, in fact, brownfields because the threat of contamination does not appear to affect development potential (Iannone 1996).

The difficulty with most brownfields lies in that they are typically found in areas where property is no longer attractive - former industrial and commercial corridors where only the poorest people remain (Leigh 1996; Leigh and Coffin 2000). Even when an area starts to draw the attention of investors, the threat of contamination makes investment appear too risky in the eyes of many developers as they look for properties with lower potential for contamination (Bartsch and Collaton 1995; Black 1995; Iannone 1996; Simons 1998; Leigh and Coffin 2000; Meyer 2000).

To take the issue down to the micro-level of analysis, the focus then becomes the impact that brownfields have on individual properties. The stated hypothesis explored in

this discussion is that property values are impacted by the existence of brownfields. Policy makers need to understand this relationship if they are to develop effective strategies for addressing brownfields. They, therefore, need a sound methodology for exploring the connection between brownfields and property values.

The literature acknowledges that the presence of brownfields acts as a deterrent to neighborhood redevelopment (Leigh 1994; Yount and Meyer 1994; Black 1995; Iannone 1995; Bartsch 1996; Leigh 1996; Simons and Iannone 1997; Chilton 1998; US Conference of Mayors 2000; Greenberg, Lowrie et al. 2000). Further, the literature recognizes key barriers to redeveloping environmentally compromised properties, liability, resources, information, and market demand being the four most prominent (Bartsch and Collaton 1995; Bartsch 1996; Davis and Margolis 1997; Coffin and Shepherd 1998; Davis and Margolis 1999). Little attention has been paid, however, to the locations of brownfields within the urban context as they affect the residents of inner cities. Thus, location needs to be mentioned as yet another barrier to brownfield redevelopment.

The logic for adding location to the mix of barriers is two-fold. First, while brownfield issues permeate all aspects of land use and development, they pose especially difficult problems for inner city neighborhoods. These urban areas are often the locations of the highest brownfield concentrations and the fact that these properties are usually idle, abandoned or otherwise underutilized further fuels the blight of urban areas. Second, these sites are also usually the locations of the highest concentrations of poverty and crime so it becomes even more important that these properties be returned to successful uses to address other, equally pernicious urban issues. Thus, the reduction in demand for

brownfield properties due to limited development potential leads to further abandonment of the surrounding area, which leads to erosion of the property tax base creating a downward spiraling effect on the health and vitality of the neighborhood (Leigh 1996). Additionally, allowing brownfield properties to go unaddressed could drastically limit efforts at reducing blight, offering more properties that could attract elicited activities and vagrant residents (Simons and Iannone 1997).

Similar to the brownfield generated divide between healthy and distressed neighborhoods, the income gap between those who can afford decent housing and those who cannot is widening, further isolating the poor from the rest of society. In 1999, The Department of Housing and Urban Development published findings that showed a record 5.3 million households were in need of some form of housing assistance despite unprecedented economic prosperity (HUD, 1999). While the need for affordable housing is recognized and increasing its provision is being addressed through programs like the Section 8 housing assistance program, implementation of these programs still remains problematic. Waiting lists for participation are long and often the supply of available units is limited, with rents often remaining out of reach for the lowest income residents (Smith 1999).

While inner city revitalization has taken a decidedly community development focus with grassroots programs designed to empower neighborhoods and build stronger communities, brownfield redevelopment and affordable housing policies continue to emphasize market-based decisions. With more than five million families needing housing assistance, affordable housing policies do not seem to be fulfilling the needs of communities (USHUD 1999). With the shift in urban housing assistance policies toward

market-based allocation of assistance (Salama 1999; Smith 1999), it appears that the poorest residents have the potential to fall further behind despite our Nation's overall economic prosperity. If the continued presence of brownfields depresses the housing prices of these distressed communities, then the personal financial situation for the poorest households will deteriorate even further.

As stated earlier in this paper, the availability of affordable housing in the US is in a crisis state. HUD's recent report of their findings states as much. The report stated four key points that indicated the seriousness of the growing shortage:

- Affordable housing stock continues to shrink, in spite of one of the strongest economic expansions in recent history.
- For the years 1997 and 1998, rents increased at twice the rate of inflation.
- While the number of affordable housing units continues to shrink, the number of renters at or below 30% of area median household incomes is increasing.
- The gap between the number of affordable housing units available and the number of people who need them is growing (USHUD 1999).

With this HUD report, the evidence is clear that we are failing our neediest citizens as policy solutions continue to fall short of their intended mark. Mentioned previously, the brownfield research and policy solutions targeted strategies that utilize market mechanisms to foster redevelopment. As with all market transactions there are winners and there are losers. Thus, in the brownfield marketplace, the policy solutions encourage redevelopment in the more marketable sections of communities such that the brownfields in less marketable sections of communities continue to be overlooked. This avoidance could pose additional consequences on the low-income residents of communities as they continue to be isolated in these neglected sections of communities. Thus, not only do the poor residents need to search for increasingly elusive housing options, they must also

accept brownfields as a part of their neighborhood. Clearly, it appears that market-based policy solutions for brownfields have a compounded effect when coupled with the affordable housing crisis. How do the affordable housing policies operate within this context?

Description of the Study

To study the effects of brownfields on the locations of affordable housing I plan to model the relationship between section 8 recipients and the locations of brownfields in Cleveland, Ohio. I selected Cleveland as a city familiar with brownfields and a community struggling to rebound from the devastating effects of past economic recessions. According to the US Conference of Mayors report on brownfields in 231 cities (US Conference of Mayors 2000), Cleveland officials estimate there are approximately 350 brownfield sites scattered throughout the city, totaling around 6,000 acres land. These officials estimate that these sites could generate between \$225 million to \$500 million in tax revenue and generate an additional 100,000 jobs if the properties were developed to their fullest potential. These brownfields estimates, at first, seem quite extensive given that Cleveland is not geographically considered a large city. Past urban policies and development history reveal another story, one that suggests numerous reasons for the extent of Cleveland's brownfields problem.

In Cleveland, the Urban Renewal program was implemented on a large scale but due to unfortunate economic circumstances in the city these efforts of the 1960's and 1970's left behind entire neighborhoods of abandoned, vacant lots where only the poorest residents remain (Krumholz 1999). Additionally, following the restructuring of the auto and steel industries in the 1970's and 1980's, Cleveland faced severe and prolonged

economic decline that left an even larger landscape of abandoned and underutilized properties. The city needed to revitalize these properties in order to revitalize their economy. Brownfield redevelopment has been a high priority for Cleveland for some time (Cuyahoga 1993).

On the housing front, Cleveland faces affordable housing difficulties similar to most major cities across the US. Section 8 and low income housing tax credit programs are readily used to assist households, however, their provision for the neediest segments of the community remains problematic. Officials in Cleveland recognize this situation, however, and have been targeting existing residents with place-based strategies to help alleviate the difficulties facing the urban poor (Melville 2001). Additionally, the city of Cleveland is facing a different urban dynamic associated with the significant depopulation from the 1960's, 1970's, and 1980's. Between 1950 and 1990, the city of Cleveland lost close to 45% of their population while the population in the region remained fairly stable (Krumholz 1999). As a result, the housing market in Cleveland is not facing the shortages of cities like Atlanta or Chicago. Instead, Cleveland faces a problem with substandard housing, calling the availability of section 8 and public housing into question (Krumholz 1999). With the federal affordable housing policy shift toward market-based mechanisms for distribution of housing assistance, one can question the impacts on Cleveland's most distressed neighborhoods.

The Research Questions and Hypothesis

The relationship that I am seeking to model first considers the effects of brownfields on property values, then the subsequent effect of property values and brownfields on the locations of section 8 recipients and then to see if that relationship

changes with distance from the brownfield. This research addresses the following questions:

1. Do brownfields have a negative effect on property values and does this negative effect increase the concentration of section 8 recipients living near brownfields?
2. How does the distance to the nearest brownfield and the number of brownfields within the neighborhood affect this relationship?

The null hypothesis is:

H_0 = There is no statistically significant relationship between the locations of section 8 housing assistance recipients and brownfields.

If the null hypothesis is rejected, the expected statistical association between section 8 housing assistance recipients and brownfields will be positive, indicating that there tends to be a higher concentration of section 8 housing assistance recipients near brownfields.

The Model

I used a two-stage least squares method for evaluating the relationship. Initially I regressed brownfields on property values to develop an instrumental variable that includes property values affected by brownfields. Then, I regressed the new property value variable on the percentage of section 8 housing assistance recipients in the census tract. I choose this method because I suspect that property value without the influence of brownfields will not adequately reflect an independent relationship. The model is as follows:

$$\begin{aligned} PV &= f(HC, NC, BF) \\ \text{Sect. 8} &= f(PV', \text{Pov}, \text{Min}, BF) \end{aligned}$$

Where PV = Property Value
HC = Housing Characteristics

NC = Neighborhood Characteristics
BF = Brownfields suspect, or cleaned up
Pov = Poverty status
Min = Minority status

The variables that I operationalized include the following:

- Sect. 8 – I used the October, 2000 report of Section 8 certificate and voucher recipients as administered by the Cuyahoga Metropolitan Housing Authority.
- BF – These are a vector of variables representing the locations of brownfields and their adjacency effects. The locational brownfield variable reflects two types of brownfields, brownfields where some level of official, environmental investigation has occurred and brownfields where the prior land use has created the potential for contamination². The adjacency effects are measured using the distance (in feet) to the nearest brownfield and the number of brownfields within 1,500 feet of a brownfield.
- PV – This variable reflects the tax assessed property value for the property in 2000 as reassessed by Cuyahoga County. I've taken the natural log of the variable to normalize the distribution.
- PV' – This variable reflects the predicted value of PV when housing characteristics, neighborhood characteristics, and the locations of brownfields are included in the valuation measure. The adjacency effects of brownfields are not measured until the second stage of the model.
- HC – These are a vector of variables used to describe housing characteristics that impact the value of a structure.
- NC – These are a vector of variables used to describe the neighborhood where the property is located. These neighborhood characteristics impact the value of a property. I used the numbers of violent crimes in the tract to measure this effect. While school quality is typically included in this vector of neighborhood characteristics, it was not a part of this vector because all census tracts were within the same school system. Information on the quality of specific schools within the system was not available.
- Pov – I used the percentage of people in the census tract receiving Federal Aid through the Aid to Families with Dependent Children program as reported in October,

² The primary attempt to associate prior land uses with a probability for contamination was made by Noonan and Vidich (1992). They surveyed 17 environmental engineering firms' experiences with cleaning up contaminated properties in the Northeastern United States during the period 1985-1989. The survey was designed to examine the connection between levels of contamination and prior land uses. With the results of this survey, the researchers established estimates for prior contamination probability based on previous land uses (commercial, industrial, residential . . .). While their efforts are not exact measurements, (thus, there is the potential for survey bias), their probability estimates have been widely cited since no other comparable data has been produced (Amekudzi, A., P. Fischbeck, et al. 1998). I am using a database I developed with Dr. Nancey Green Leigh at the Georgia Institute of Technology. Utilizing historical city directories from 1910, 1930, 1950, and 1970, we input addresses for businesses where the business activity held a 50% or greater probability for contamination according to Noonan and Vidich.

2000. This variable serves as a proxy for poverty in absence of current census data on the numbers of persons living below poverty.

- Min – I used the current 2000 Census variable for the numbers of African Americans living in the census tract and also calculated the percentage change in African Americans.

Study Findings

The results from the two-stage model yield interesting and significant results. The first stage of the model demonstrating the effects of housing characteristics, neighborhood characteristics, and the evidence of brownfields (either potential or officially investigated) on assessed property values in 2000, accounted for 33% of the variation in assessed property value. Each of the variables demonstrated a significant relationship with assessed property value with the exception of the officially investigated (listed) brownfields at the 95% confidence level. The listed variable, however, was hardly insignificant, within a confidence level of 85%. The second stage of the model, regressing the predicted property values from the first stage, along with socioeconomic and brownfield adjacency variables on the percentage of section 8 households per census tract also proved to have significant explanatory power, explaining over 70% of the variation in concentration of Section 8 households per census tract. In the second stage, the socioeconomic variables all proved to be highly significant, as expected, with the percentages of persons receiving Federal aid and the percentages of African Americans and the percent change in African Americans having an increasing concentration effect on the percentages of Section 8 households in the census tract.

To determine the adjacency effects of brownfields on the concentration of Section 8 households, I tested a number of different brownfield adjacency variables, considering both distance to the nearest brownfield and the concentrations of brownfields within 500,

1,000 and 1,500 feet of a property. I used these separate measures as a way to isolate neighborhood effects from distance effects. Distance to the nearest brownfield proved to have little effect on the concentrations of Section 8 households within the census tract. The neighborhood effects isolated the adjacency effects more significantly, indicating that increased concentrations of brownfields within 1000 feet of a property increased the concentrations of Section 8 households while the numbers of brownfields within 1,500 feet of a brownfield actually decreased the concentration of Section 8 households.

Table 1 reports the coefficients, transformed from the natural log into the real effect for each of the variables, representing the effect that a one unit increase in the independent variable has proportionately on the percentage of Section 8 households per census tract.

Table 1: Effects on the Concentrations of Section 8 Households / Census Tract

Variable	Effect
Assessed Property Value in 2000	-52.58%
Percent African American	4.96%
Percent Persons Receiving Federal Aid	16.15%
Percent Change in African American Population	.06%
Number of Brownfields within 1,000 feet of property	.18%
Number of Brownfields within 1,500 feet of property	-.15%

To highlight some of the more interesting findings:

- The adjusted property value, incorporating the effects of brownfields into the assessment, had over a 52% deconcentrating effect on the percentage of Section 8 households per census tract. This finding is significant as it indicates that as property values rise with brownfield redevelopment, Section 8 households are potentially

further excluded from the benefits of redevelopment...more and better housing opportunities.

- Race and poverty appear to have further concentrating effects on Section 8 households. This finding suggests that environmental injustice claims could be made regarding the brownfields that are cleaned up versus those that remain neglected, which begs the question, where and how are redevelopment decisions being made?
- The neighborhood effects at 1,000 feet, while significant, have a much smaller concentrating effect and appear to be limited to within a two-block radius of the property. The neighborhood effects measured at 1,500 feet have a deconcentrating effect, which suggests that, given the greater variation, the impact of brownfields in the neighborhood falls away. Thus, the effect appears to be isolated to within a small subsection of the neighborhood.

The SPSS output from each model can be found in the Appendix of the paper.

Some Concluding Thoughts

As with most quantitative studies, limitations exist in how far one can take the analysis of data in interpreting an outcome, and this study is no exception. While I have suggested that a concentrating effect is happening in the percentages of Section 8 households that also live near brownfields, I am not suggesting any causal effects. I cannot say, with this data, that brownfields are forcing this concentration effect. I will suggest, however, that a Section 8 household concentration effect is occurring more predominantly near brownfield sites, which should invoke urban policy reconsiderations. To that effect, this research further justifies joint policy development between the US EPA and HUD. In my experiences working with Brownfield Pilot initiatives in Atlanta, GA and Louisville, KY, the brownfield Pilot coordinators have incorporated brownfield redevelopment activities into existing Empowerment Zone programs. Anecdotally, however, I have yet to see any successful outcomes. With these research findings, a careful evaluation of the two programs in Cleveland is warranted.

Appendix

First stage of model incorporating the effects of brownfields and property characteristics into a predicted value for the natural log of total assessed property value in 2000

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.576	.332	.332	.4424

a Predictors: (Constant), VLNTRM9, TWN, LISTED, BIL, POTENTIA, BEDBATH, BEDAGE, SPL, FIREPL, ACRES, DETGAR, RAN, BUN, AGE, ATTGAR, BEDROOMS, LIVATOT, BATHTOT, COL

b Dependent Variable: LNTOT00

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11425.870	19	601.362	3072.443	.000
	Residual	22993.673	117478	.196		
	Total	34419.543	117497			

a Predictors: (Constant), VLNTRM9, TWN, LISTED, BIL, POTENTIA, BEDBATH, BEDAGE, SPL, FIREPL, ACRES, DETGAR, RAN, BUN, AGE, ATTGAR, BEDROOMS, LIVATOT, BATHTOT, COL

b Dependent Variable: LNTOT00

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	9.384	.096		97.948	.000
	POTENTIA	-5.638E-02	.011	-.013	-5.249	.000
	LISTED	-6.388E-02	.040	-.004	-1.580	.114
	TWN	-.827	.169	-.014	-4.885	.000
	RAN	.343	.095	.188	3.612	.000
	BIL	.382	.109	.017	3.492	.000
	SPL	.598	.097	.075	6.180	.000
	BUN	.295	.095	.246	3.106	.002
	COL	.262	.095	.236	2.760	.006
	ATTGAR	.416	.008	.138	50.640	.000
	DETGAR	.344	.003	.279	107.316	.000
	AGE	-2.825E-03	.000	-.196	-75.631	.000
	BEDAGE	-.839	.016	-.136	-53.637	.000
	BEDROOMS	-5.110E-02	.004	-.102	-14.440	.000
	BATHTOT	-1.568E-02	.007	-.017	-2.185	.029
	BEDBATH	3.094E-02	.004	.044	7.150	.000
	FIREPL	.210	.004	.147	59.800	.000
	LIVATOT	2.183E-04	.000	.228	53.830	.000
	ACRES	.417	.011	.097	39.480	.000
	VLNTRM9	-7.687E-03	.000	-.260	-102.649	.000

a Dependent Variable: LNTOT00

Second stage of model incorporating the predicted value of the dependent variable from the first stage into a model of the effects on the concentrations of Section 8 households/census tract

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.842	.709	.709	1.7546

a Predictors: (Constant), Z500FT, CHGBLK, LNMKT00A, PCTBLK00, PCTAID00, Z000FT

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	885779.557	6	147629.926	47953.281	.000
	Residual	363295.624	118006	3.079		
	Total	1249075.181	118012			

a Predictors: (Constant), Z500FT, CHGBLK, LNMKT00A, PCTBLK00, PCTAID00, Z000FT

b Dependent Variable: PCTHHS8

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta			
1	(Constant)	7.095	.195			36.384	.000
	LNMKT00A	-.746	.019	-.074		-38.393	.000
	PCTBLK00	4.842E-02	.000	.620		286.910	.000
	PCTAID00	.150	.001	.302		127.211	.000
	CHGBLK	5.544E-04	.000	.078		44.586	.000
	Z000FT	1.846E-03	.001	.006		1.823	.068
	Z500FT	-1.505E-03	.001	-.009		-2.797	.005

a Dependent Variable: PCTHHS8

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