Why Is Detroit So Empty?

EXPLAINING URBAN ABANDONMENT THROUGH FACTORS OTHER THAN POPULATION LOSS

Eric LaRose

The decline of industrial cities in the midwestern and northeastern United States has been accompanied by significant population loss of inner cities as residents migrate to the suburbs. Cities such as Cleveland, St. Louis, and Detroit have less than half the population they did 50 to 60 years ago and continue to lose residents; others, such as Chicago, Philadelphia, and Minneapolis, have rebounded in recent years but still have populations 20 to 30 percent below their peak levels. Of course, the housing stock of a city rarely declines, so population loss means a relatively fixed number of homes are chasing fewer residents. When population loss is long-lasting and significant, this phenomenon gives rise to large-scale residential abandonment.

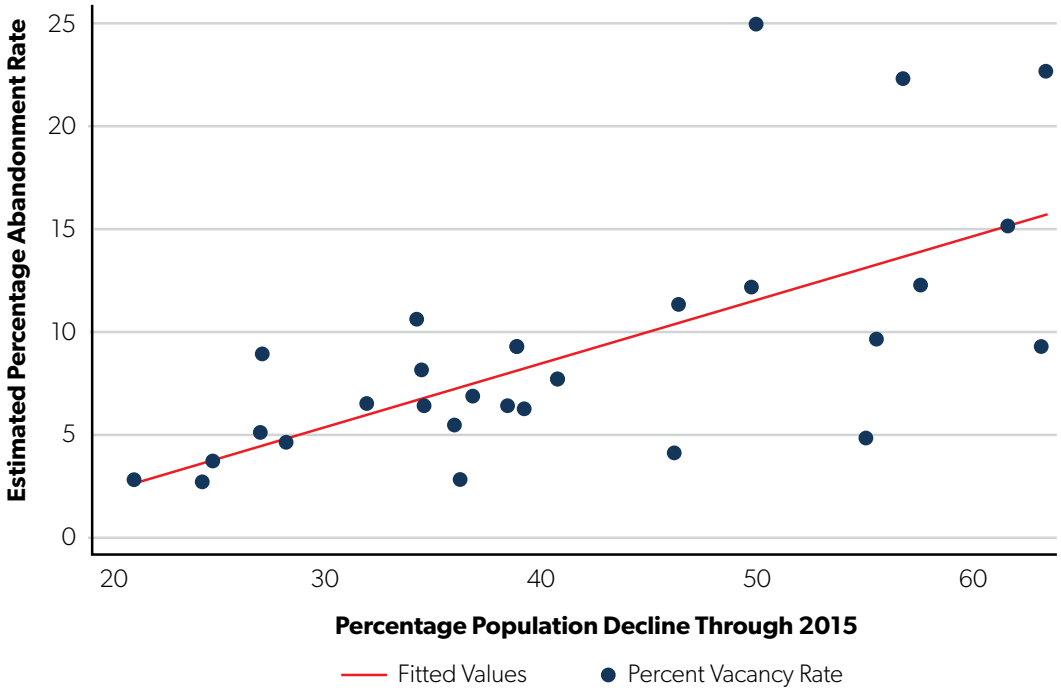
Such abandonment has hit Detroit harder than any other large city in the country. Large swaths of the city have become "urban prairie," in which most lots are empty and nature has started to reclaim neighborhoods.[1] Detroit's city government has identified and recommended for demolition more than 46,000 vacant structures or lots.[2]

Abandoned and blighted structures pose a significant problem for urban cities. Abandoned houses often serve as havens for prostitution, drug dealing, and other criminal activity.[3] Such structures decrease the housing values of nearby residences and frequently cause fires that can spread to occupied buildings.[4] Some evidence suggests that abandoned buildings raise the probability of nearby homes becoming abandoned themselves, further compounding such problems.[5] Large-scale urban revival will require that blighted cities reduce or at least slow the spread of residential property abandonment.

While cities such as Gary, Cleveland, and St. Louis have large areas of abandoned homes and lots, the problem seems especially severe in Detroit, even though the latter three cities have lost a comparable percentage of their populations. Although it might be reasonable to expect a nearly one-to-one ratio between population loss and abandonment rates, this does not seem to be the case. A February 2016 report by RealtyTrac estimated that Detroit had a residential abandonment rate of 18.6 percent.[6] In contrast, Youngstown, Ohio, had a vacancy rate of 6.7 percent even though both cities have lost almost the same percentage of their populations. St. Louis, Gary, Buffalo, and Cleveland all have abandonment rates under 5 percent even though they have lost more than half their populations. But Toledo and Baltimore have rates over 6 percent even though they have lost only 27 percent and 35 percent of their populations, respectively.[7]

Among the 28 cities examined here, a simple linear regression explaining a city's abandonment rate in the second quarter of 2016—determined using the United States Postal Service (USPS) count of the number of homes failing to collect mail for at least three months—as a function of its population loss from its peak population through 2015 reveals a correlation of 0.6584 and an R-squared value of 0.4335. While Figure 1 certainly shows a moderately strong relationship between population loss and abandonment rates, the R-squared value means that only 43.35 percent of

Figure 1. Population Loss and Abandonment Rates



Source: United States Postal Service.

the variation in abandonment rates between these cities can be explained by population loss. As population loss rates increase, so do the deviations from the best-fit line, which estimates that Detroit, for instance, should have an abandonment rate of just 15.7 percent as opposed to its current rate of 22.5 percent. These facts and others suggest that population loss alone inadequately explains residential abandonment. Hence, this paper will use census-tract-level data on abandonment in Rust Belt cities to examine the extent to which certain political, economic, and demographic factors, as well as population loss, contribute to abandonment.

Before proceeding, differentiating between vacancy and abandonment is important. A vacant home is not currently occupied but has an identifiable owner; an abandoned home does not have an identifiable owner, usually because its former owner has legally relinquished control of the property or walked away with no intent of return. Many vacant properties are in transition from one owner to another and will soon be occupied again. In contrast, abandoned properties will not see a new owner anymore and will likely exhibit the characteristic signs of urban blight. Peter Marcuse more rigorously defined home abandonment as occurring when "all those having a private profit-oriented economic interest in a unit lose any incentive for continued ownership beyond the immediate future, and are willing to surrender title to it without compensation, because of the absence of effective demand for its continued use or reuse."[8] This paper is concerned with abandoned structures, not vacant ones, although of course there is significant overlap between the two.

Literature Review

Because abandonment has traditionally been difficult to measure and different cities have used various definitions of abandonment, most of the literature on the topic has focused either on abandonment across

neighborhoods in a single city or on abandonment as a more general symptom of neighborhood decline. This paper builds on that literature by using newly available data to analyze variations in abandonment rates across cities that have experienced heavy population loss.

The Neighborhood Life Cycle. Numerous studies have focused on residential abandonment in inner-city neighborhoods as part of a normal cycle of urban decline and renewal, suggesting that the simple passage of time may breathe new life into neighborhoods plagued by abandonment. In a *Journal of Urban Economics* article, Stuart Rosenthal examined changes in the socioeconomic status of urban neighborhoods over time and found that "change in neighborhood economic status is common over a sufficiently long time horizon. Roughly two-thirds of urban neighborhoods in 1950, for example, were of quite different economic status in 2000."[9] This occurs in part because more affluent groups prefer to buy newer housing and will eventually leave older housing originally built to cater to the affluent. Since most neighborhoods "will be of fundamentally different economic status twenty to forty years in the future," the hardest-hit neighborhoods will possibly eventually see urban renewal as the neighborhood life cycle continues.[10]

Interestingly, Jacob Vigdor finds that abandonment may not merely be a part of the cycle but instead can contribute to it; that is, abandoned structures are not merely symptoms of a declining neighborhood, but they hasten its decline.[11] Vigdor estimated that "households are willing to pay between 1% and 3% of their annual income for a one-standard-deviation improvement in neighborhood quality,"[12] with the presence of abandoned structures being one proxy for neighborhood quality. In particular, households had an implied marginal willingness to pay between $850 and $2,100 per year to avoid the presence of abandoned housing depending on their demographic and economic characteristics. Vigdor's findings suggest that addressing the problem of abandonment is crucial to preventing further abandonment and neighborhood decline.

Causes of Abandonment. Numerous other scholars have examined determinants of abandonment beyond the normal cycle of decline and renewal. John Accordino and Gary Johnson observe that in addition to the normal functioning of housing markets, government policies at all levels have played a role in fomenting residential abandonment. Federal policies in the post–WWII era encouraged middle-class flight from urban centers; state and local policies have often excessively taxed property values or discouraged the transfer of property through laws on wills and titles.[13] Abandonment may also be explained in part by broader macroeconomic trends. Peter Marcuse observed that, in the early 1980s, abandonment and gentrification were occurring simultaneously across New York City. The shift in the American economy from manufacturing toward services greatly helped skilled workers, who increasingly demanded expensive housing near city centers. Meanwhile, low-skilled workers saw lower wages and reduced employment, making it harder for them to afford rent and thus fomenting abandonment in neighborhoods beyond the core.[14]

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Perhaps unsurprisingly, the poverty rate in a neighborhood seems to be a strong predictor of its abandonment rate. Using 1990 census-tract-level data from New York City, Benjamin Scafidi et al. found that "the mean poverty rate for the census tracts in which abandoned buildings were located was 33%, compared to only 15% for nonabandoned buildings."[15]

Several studies have looked more specifically at the causal impacts of property taxes on abandonment. Basic economic theory suggests that higher property taxes should lead to higher abandonment rates by

raising the costs of continuing to live in a house. As New York City began to grapple with the problem of abandonment in the 1970s and 1980s, several researchers looked at abandonment data in that city specifically. Michelle White constructs a model in which housing quality depreciates over time and "owners of vacant lots are assumed to maximize discounted future profits in choosing the best land use."[16] If the quality of the surrounding neighborhood declines, the owner of a residential property may decide to abandon it to "maximize the discounted present value of rents minus property taxes during the remaining period over which the building is held."[17] Consequently, abandonment will occur when the gains from retaining ownership for one extra period equal the amount to be paid in property taxes. Cities allow "grace periods" for landlords to refuse to pay property taxes, and shorter grace periods are expected to discourage abandonment. Using data for New York City neighborhoods in 1976 and 1978 to estimate the model, White concludes that "property taxes have a very large and significant effect on abandonment rates . . . the elasticity of the abandonment rate with respect to property taxes for 1978 is 1.65."[18]

Thus, relatively small absolute changes in property taxes can drastically affect the number of abandoned structures. Likewise, David Arsen used data from New York for 1970–71 and found an assessment rate elasticity of 2.0 for apartments and 3.7 for single-family homes. This means that a 1 percent increase in the property tax assessment rate will increase the abandonment rate for homes by 3.7 percent.[19] Although Arsen and White do obtain different elasticity estimates, both estimates suggest an economically and statistically significant impact of property taxes on abandonment rates.

Scafidi et al. also use data from New York City but on a more "micro" scale, in which they model an individual's decision to abandon property based on financial incentives. In this model, a property owner "abandons the property when the ratio of the value of all city liens against the property to the market value of the property is greater than one."[20] Using data from 1990, the authors find that, as their model predicts, the ratio of the value of liens against the property to the market value of the property is a statistically significant predictor of abandonment at the 1 percent level, as are neighborhood poverty rates and building code violations.[21]

Abandonment tends to cluster in certain neighborhoods because predictors of abandonment, such as poverty rates, also cluster.

Additionally, one cause of further abandonment may be the existing presence of abandonment. As Arsen noted, "Once abandonment in an area proceeds beyond a threshold point, its proliferation is propelled by an accelerating, self-reinforcing dynamic which has been modeled as a contagious process."[22] Examining abandonment patterns in Cleveland between 1980 and 1990, David Wilson, Harry Margulis, and James Ketchum found that it was indeed the case that housing abandonment "spread in a contagious fashion beyond a dilapidated core."[23] Overall, this suggests that, all else being equal, a house has a higher probability of becoming abandoned at some point in the future if other abandoned homes are in its vicinity. Looking beyond Cleveland to Youngstown and Columbus, Victoria Morckel concludes that abandonment tends to cluster in certain neighborhoods because predictors of abandonment, such as poverty rates, also cluster. Additionally, "abandonment in surrounding neighborhoods predicts abandonment in the neighborhood itself," further suggesting that abandonment spreads in a contagious fashion.[24]

Overall, Morton Baratz et al. conclude that the neighborhood life cycle theory is inadequate to account

for abandonment because it predicts that only neighborhoods at the bottom of the ladder will witness it. Instead, abandonment occurs in neighborhoods of all types, meaning a variety of other factors must explain it.[25] Here we will explore some potential factors.

Methodology

This paper examines data at the census-tract level for medium- and large-sized central cities in the Rust Belt. Cities were selected from the following states generally associated with that region: Delaware, Illinois, Indiana, Maryland, Michigan, Minnesota, Missouri, New Jersey, New York, Ohio, Pennsylvania, and Wisconsin. Cities in these states then had to satisfy three criteria to be selected for this analysis:

1. The city had to have had a peak population of more than 100,000 residents. Except for Saginaw, Michigan, which had a peak population of about 98,000, no other city came nearly so close to this requirement before beginning population decline. The majority of the cities analyzed here experienced their peak populations in either 1950 or 1960.

2. The city has to have seen its population decline by at least 20 percent between its peak year and 2015. Most cities meeting this threshold exceeded a 20 percent decline by large margins, with eight of the 28 cities losing more than half of their populations.

3. The city must be a traditional urban center with a large industrial base. Most of the cities chosen obviously qualify as the heart of medium- or large-sized metropolitan areas. Others, such as Camden, New Jersey, and Gary, Indiana, are part of larger metropolitan areas but still possess a distinctive urban core. Cities such as Warren, Michigan, fit the first two criteria but clearly developed as suburban bedroom communities and were thus excluded from this analysis.

In total, 28 cities fit the above three criteria to be included in this analysis and are shown with their population declines in Table 1.

Measuring Abandonment. Urban abandonment has traditionally been difficult to measure. While the Census Bureau tracks vacancies at the census-tract level, a housing unit is "vacant if no one is living in it at the time of the interview. . . . Vacant units are excluded if they are exposed to the elements, that is, if the roof, walls, windows, or doors no longer protect the interior from the elements, or if there is positive evidence (such as a sign on the house or block) that the unit is to be demolished or is condemned." Thus, only a small subset of properties classified by the Census Bureau as vacant will likely be abandoned, and many properties showing obvious signs of abandonment (exposure to the elements) are excluded from this category.[26] Individual cities suffering from urban blight have tried to measure the number of abandoned homes in their boundaries, but different cities use different measures of abandonment, making it impossible to use these surveys to compare abandonment across cities.[27]

Luckily, over the past few years the Department of Housing and Urban Development (HUD) has begun partnering with the USPS to provide data on residential properties likely to be abandoned.[28] Mail carriers regularly note the occupancy statuses of properties on their routes, and in 2006 HUD began an agreement to make these data available to researchers; these data are an extremely valuable source for research on abandonment since they cover every single property in the United States and use a single and uniform classification system for occupancy status. The data are from the second quarter of 2016 and are taken at the census-tract level, using census-tract boundaries as determined in the 2010 census.

Using data at the census-tract level has several advantages. Census tracts are designed to have between 1,000 and 8,000 residents, and census tracts in urban areas are geographically quite small. Unlike, say, ZIP codes, census tracts are small enough to be relatively homogeneous in terms of socioeconomic and demographic characteristics.

Table 1. Population Declines by City

City	State	Peak Population Year	Peak Population	2015 Population	Percentage Decline Through 2015
Detroit	MI	1950	1,849,568	677,116	63.39
Saginaw	MI	1960	98,265	49,347	49.78
Flint	MI	1960	196,940	98,310	50.08
Cleveland	OH	1950	914,808	388,072	57.58
Akron	OH	1960	290,351	197,542	31.96
Canton	OH	1950	116,912	71,885	38.51
Cincinnati	OH	1950	503,998	298,550	40.76
Dayton	OH	1960	262,332	140,599	46.40
Toledo	OH	1970	383,818	279,789	27.10
Youngstown	OH	1950	168,330	64,628	61.61
Buffalo	NY	1950	580,132	258,071	55.52
Rochester	NY	1950	332,488	209,802	36.90
Albany	NY	1950	134,995	98,469	27.06
Syracuse	NY	1950	220,583	144,142	34.65
Utica	NY	1940	100,518	61,100	39.21
Newark	NJ	1930	442,337	281,944	36.26
Trenton	NJ	1950	128,009	84,225	34.20
Camden	NJ	1950	124,555	76,119	38.89
Philadelphia	PA	1950	2,071,605	1,567,442	24.34
Pittsburgh	PA	1950	676,806	304,391	55.03
Scranton	PA	1930	143,433	77,118	46.23
Erie	PA	1960	138,440	99,475	28.15
Wilmington	DE	1940	112,504	71,948	36.05
Baltimore	MD	1950	949,708	621,849	34.52
Gary	IN	1960	178,320	77,156	56.73
Chicago	IL	1950	3,620,962	2,720,546	24.87
St. Louis	MO	1950	856,796	315,685	63.16
Minneapolis	MN	1950	521,718	410,939	21.23

Source: US Census Bureau.

Furthermore, they are the smallest statistical unit for which demographic and economic data, as well as data on abandonment rates, are readily available.

The HUD data identify two categories of addresses that are likely to have been unoccupied for some time, vacant and no-stat addresses, and show how many properties have been in that category for three months, six months, nine months, and so on, with properties unoccupied for three years or longer all lumped together. Vacant properties are defined as not having collected their mail for 90 days or longer, although most vacant properties have not collected mail for a much longer period; of the nearly 350,000 vacant properties in these cities, less than 10 percent have failed to collect for less than six months, and more than half have not collected for at least three years. This definition of vacancy closely matches the traditional definition of "abandoned" in that residents who fail to collect their mail for months at a time are generally no longer living there and have

Table 2. Summary Statistics for Census Tracts

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
1970 Population	3,139	4,548.945	2,103.447	37.48	19,374.15
1980 Population	3,139	3,847.706	1,687.018	14.58	13,712.4
1990 Population	3,139	3,522.529	1,510.678	13.56	10,614.62
2000 Population	3,139	3,385.536	1,491.731	15.45	11,341
2010 Population	3,139	3,124.091	1,514.489	0	16,735
Percentage White in 1970	3,139	72.06622	36.63644	0.03	100
Percentage White in 1980	3,139	55.9348	38.37559	0.03	100
Percentage White in 1990	3,139	48.53149	37.80847	0.04	99.6
Percentage White in 2000	3,139	39.4231	34.66083	0	99.14
Percentage White in 2010	3,135	35.53498	32.14961	0	100
Percentage Age 60 or Over in 1970	3,139	16.9781	6.720238	0.77	51.65
Percentage Age 60 or Over in 1980	3,139	18.44191	8.006094	0	70.22
Percentage Age 60 or Over in 1990	3,139	18.09471	7.754329	0.93	62.2
Percentage Age 60 or Over in 2000	3,139	15.69943	6.963567	0.26	85.37
Percentage Age 60 or Over in 2010	3,135	16.1911	7.100845	0	75
Percentage of Adults 25+ w/ College Degrees in 1970	3,139	7.810465	8.968655	0	76.44
Percentage of Adults 25+ w/ College Degrees in 1980	3,134	11.98421	12.57171	0	87.31
Percentage of Adults 25+ w/ College Degrees in 1990	3,139	15.80979	15.90155	0	91.69
Percentage of Adults 25+ w/ College Degrees in 2000	3,138	19.03601	18.22918	0	88.59
Percentage of Adults 25+ w/ College Degrees in 2010	3,128	23.12057	20.81803	0	100
Unemployment Rate in 1970	3,139	5.096168	2.81971	0	18.9
Unemployment Rate in 1980	3,132	11.94038	7.027576	0	59.84
Unemployment Rate in 1990	3,139	12.83064	9.111857	0	63.91
Unemployment Rate in 2000	3,137	11.7978	8.158204	0	68.99
Unemployment Rate in 2010	3,126	14.96213	9.902967	0	100
Poverty Rate in 1970	3,139	14.3658	10.94344	0	65.81
Poverty Rate in 1980	3,133	20.28239	14.58813	0	88.52
Poverty Rate in 1990	3,139	24.27302	16.81565	0	88.51
Poverty Rate in 2000	3,138	23.54832	14.33126	0	82.15
Poverty Rate in 2010	3,128	27.01858	16.05081	0	100
Household Income in 1970 (2010 Dollars)	3,136	43,734.06	14,987.4	4,607.22	175,885.2
Household Income in 1980 (2010 Dollars)	3,133	37,278.18	13,666.2	6,625	119,538.9
Household Income in 1990 (2010 Dollars)	3,136	38,626.98	16,758.99	8,348.33	139,212.5
Household Income in 2000 (2010 Dollars)	3,135	40,655.11	17,820.68	7,192.01	140,646.2
Household Income in 2010 (2010 Dollars)	3,119	38,063.91	19,359.06	6,593	151,250

(continued on the next page)

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Median Home Value in 1970 (2010 Dollars)	3,087	87,263.56	40,120.85	18,802.78	358,815.3
Median Home Value in 1980 (2010 Dollars)	3,104	91,695.74	65,057.44	13,250	596,250
Median Home Value in 1990 (2010 Dollars)	3,134	111,202.7	96,855.6	0	835,001.7
Median Home Value in 2000 (2010 Dollars)	3,135	122,539.5	89,256.57	0	857,885
Median Home Value in 2010 (2010 Dollars)	3,074	168,962.3	124,371.4	14,600	897,500
Housing Units in 1970	3,139	1,608.741	740.1683	0	6,365.49
Housing Units in 1980	3,139	1,558.235	674.2207	0	5,558
Housing Units in 1990	3,139	1,497.254	651.0183	1.77	5,266
Housing Units in 2000	3,139	1,465.267	648.7711	1	5,183
Housing Units in 2010	3,139	1,458.768	717.8678	0	11,681
Housing Units in Q2 2016	3,139	1,521.514	840.5523	10	13,080
Houses Not Collecting Mail at Least 90 Days Q2 2016	3,139	1,10.3797	121.3414	0	921
No-Stat Housing Units in Q2 2016	3,139	1,17.2514	288.1131	0	4,330

Source: US Census Bureau and Longitudinal Tract Database.

essentially relinquished control of their property. No-stat addresses primarily fall into two categories: homes identified as "not likely to be active for some time" and newly built homes that have yet to be occupied but will be soon.[29] Because there is no way to distinguish between the two categories, using no-stat measures as a proxy for abandonment can be tricky. In most of these cities, new residential construction is essentially nonexistent, and virtually all the no-stat addresses are likely abandoned. Still, some of the highest no-stat rates are found in gentrifying and rapidly growing neighborhoods in places such as the North Side of Chicago, Philadelphia's Center City, and Uptown Minneapolis, where no-stats represent new construction rather than abandoned structures. To account for this potential issue, I created an "adjusted no-stat" variable that gives a no-stat count of zero to neighborhoods with high no-stat rates where such no-stats likely represent new construction. Furthermore, I will use and analyze two separate measures of abandonment rates: one including just properties classified as vacant and one including both vacant and "adjusted no-stat" structures.

Measuring Other Tract-Level Data. Since the USPS data are at the 2010 census-tract level, I used the Census Bureau to obtain demographic and economic data for these census tracts in the 2010 census.[30] The literature suggests that urban abandonment is a long-term process that arises after several decades of neighborhood decline. Consequently, truly understanding factors contributing to abandonment requires us to look at how these demographic and economic characteristics change over time. Unfortunately, boundaries of census tracts can and often do change from one census to another, making it difficult to compare the same geographic units over time.[31]

To get around this problem, I used the Longitudinal Tract Database, which uses 2010 census-tract boundaries to interpolate data for these same boundaries for the 1970, 1980, 1990, and 2000 censuses.[32] Data are not available for earlier censuses, in part because most of the country was not consolidated into census tracts before 1970.[33] By 1970, most of the cities considered here had seen slight declines but still retained the large majority of their peak populations; severe declines would occur later in the 1970s and 1980s. Thus, using data from 1970 onward should provide a clear picture of how neighborhoods in these cities changed over time and the extent to which those changes contributed to urban abandonment.

Table 3. Vacancy and No-Stat Rates by City

City	Percentage of Resident Properties Vacant	Percentage of Residential Properties No-Stat	Total Vacancy and No-Stat Rate
Wilmington	5.376888	11.72364	17.10053
Chicago	3.575018	7.36051	10.93553
Gary	22.21661	10.58268	32.7993
Baltimore	8.067411	9.604229	17.67164
Flint	24.82492	8.703443	33.52837
Saginaw	12.04547	8.921229	20.9667
Detroit	22.53193	6.122295	28.65423
Minneapolis	2.720029	6.058537	8.778566
St. Louis	9.159793	10.37828	19.53807
Camden	9.113102	8.669814	17.78292
Newark	2.704114	14.84032	17.54443
Trenton	10.50353	4.610885	15.11441
Albany	5.004345	6.233706	11.23805
Buffalo	9.470721	8.262834	17.73355
Rochester	6.721902	5.722595	12.4445
Utica	6.162876	4.222303	10.38518
Syracuse	6.299081	8.343642	14.64272
Cleveland	12.1669	9.303339	21.47024
Cincinnati	7.604695	6.273003	13.8777
Toledo	8.77398	3.154697	11.92868
Youngstown	15.08783	8.812105	23.89994
Dayton	11.20945	6.871615	18.08107
Canton	6.346665	4.934072	11.28074
Akron	6.397329	6.907473	13.3048
Pittsburgh	4.706205	10.54066	15.24687
Erie	4.521776	7.467976	11.98975
Scranton	3.979671	9.473231	13.4529
Philadelphia	2.625084	7.28738	9.912464

Source: United States Postal Service.

Measuring Citywide Data. Data on cities' violent and property crime rates were taken from the FBI's Uniform Crime Reporting Statistics, which provides data on annual crime rates for cities for most years dating back to 1985. Data were gathered for the years 1985, 1990, 1995, 2000, 2005, and 2010; every city had crime data available for all even-numbered years, but some did not have data available for all odd-numbered years. The property crime rate was taken as given, but because Chicago did not have data available for some types of violent crimes, the violent crime rate was calculated as the sum of the murder rate, robbery rate, and negligible assault rate.[34] Obviously crime data are at the city level, not the census-tract level; unfortunately, uniform crime comparisons at a level finer than the city level are not available.

Data for these cities on taxes, expenditures, and debt were taken from the Lincoln Institute of Land Policy's Fiscally Standardized Cities database. City

Table 4. Tax Revenue Collected in Property Tax

City	Property Tax Revenue Per Capita 1980 (2010 Dollars)	Property Tax Revenue Per Capita 1990 (2010 Dollars)	Property Tax Revenue Per Capita 2000 (2010 Dollars)	Property Tax Revenue Per Capita 2010 (2010 Dollars)
Wilmington	1,033.5	1,487.97	1,096.01	1,292
Chicago	842.7	1,302.6	1,316.99	1,342
Gary	967.25	1,063.79	1,728.47	1,511
Baltimore	696.95	985.3	924.56	1,220
Flint	1,041.45	1,153.97	913.13	678
Detroit	882.45	845.02	712.47	844
Minneapolis	1,250.8	1,795.25	1,569.72	1,809
St. Louis	572.4	574.48	772.16	829
Buffalo	924.85	841.68	731.52	844
Rochester	1,171.3	1,384.43	1,376.68	1,194
Syracuse	863.9	1,130.59	601.98	870
Cleveland	977.85	910.15	1,046.48	989
Cincinnati	707.55	1,090.51	1,211.58	1,448
Toledo	625.4	816.63	875.03	855
Dayton	800.3	861.72	948.69	944
Akron	731.4	873.41	916.94	1,026
Pittsburgh	848	1,237.47	1,174.75	1,169
Philadelphia	540.6	681.36	656.59	663

Source: Lincoln Institute of Land Policy, "Fiscally Standardized Cities Database," http://www.lincolninst.edu/subcenters/fiscally-standardized-cities/.

property tax rates have been difficult to find historical data for, as residents of cities pay property taxes not only to city governments but also to school districts and other jurisdictions. Furthermore, there can be large discrepancies between rates on paper and actual rates paid. To get around these problems, the Fiscally Standardized Cities database determines the total property tax rate and uses that to calculate the per capita tax rate, which reflects the average amount that a resident of the city pays in property taxes. Similarly, the database calculates per capita revenue levels from other forms of taxes, expenditures per capita on various categories, and per capita debt levels for cities back through 1977. Such data were available for 18 of these 28 cities for the years 1980, 1990, 2000, and 2010; the 10 for which data were not available are mostly those with smaller population sizes, such as Youngstown and Saginaw.[35]

Descriptive Data. Overall, these 28 cities contain 3,139 census tracts. Table 2 shows summary statistics for various economic and demographic characteristics; not every piece of data was available for every census tract, so some of these variables have fewer than 3,139 observations.

Looking at the evolution of these variables, we can see that the "average" census tract in these cities lost roughly a quarter of its population over the period from 1970 to 2010 and went from majority to minority white. The poverty rate in the average tract doubled, while the unemployment rate tripled; these figures for 2010 may be higher than usual because of the lingering effects of the Great Recession, but a large upward trend still exists from one census to the next.

Data on Tax Burdens by City. Table 4 shows the tax revenue collected per capita in property taxes in

Table 5. Property Tax Burden

City	Property Tax Burden 1980	Property Tax Burden 1990	Property Tax Burden 2000	Property Tax Burden 2010
Wilmington	1.433824	1.157143	0.9685746	0.7209821
Chicago	0.6737288	1.005155	0.7832326	0.4985141
Gary	1.448413	2.035144	2.548689	2.202624
Baltimore	0.9100346	1.09462	1.053546	0.7605985
Flint	1.488636	2.044379	1.44668	1.107843
Detroit	1.585714	2	0.8820754	1.049751
Minneapolis	0.8660551	1.509831	1.088987	0.7909926
St. Louis	0.8181819	0.6921529	0.9514866	0.678396
Buffalo	1.544248	1.081545	0.9713323	1.284627
Rochester	1.719844	1.281298	1.768352	1.622283
Syracuse	1.051613	1.011958	0.6970588	1.043165
Cleveland	1.213816	1.34901	1.142857	1.140715
Cincinnati	0.6528117	1.074013	1.025806	1.116423
Toledo	0.6243386	1.010331	0.9150067	0.8860103
Dayton	1.067138	1.211268	1.109955	1.193426
Akron	0.8440367	1.210648	0.9437909	1.117647
Pittsburgh	1.015873	1.82963	1.549414	1.372066
Philadelphia	0.7816091	0.8429752	0.8659967	0.4903846

Source: Lincoln Institute of Land Policy, "Fiscally Standardized Cities Database," http://www.lincolninst.edu/subcenters/fiscally-standardized-cities/.

each city (some smaller cities did not have these data available), using the standardized measures compiled by the Lincoln Institute of Land Policy.[36] The property tax burden, displayed in Table 5, was calculated as the property tax revenue per capita divided by the city's median home value—in other words, it is the percentage of a home value that a resident pays annually in property taxes. Some cities that collect relatively large amounts in property taxes have relatively low property tax burdens because of high home values.

Table 6 shows the nonproperty tax burden, which is calculated as the amount a resident of a city pays in nonproperty city taxes (including income taxes) divided by the city's per capita income. Unlike the property tax burden, which stayed relatively constant in most cities, the nonproperty tax burden has generally increased in most cities.

Analysis and Results

The first set of regressions we run looks to explain census-tract abandonment rates by considering only demographic and economic characteristics of these cities, ignoring variations in citywide policies. Census tracts that gained population between 1970 and 2010 are not included in these regressions as many if not most of their "abandoned" properties are new and soon-to-be-occupied construction (no-stat) rather than actually abandoned properties. All regressions are run twice, with one using just the vacancy rate as the dependent variable and another using the vacancy plus adjusted no-stat rate. The first regression simply regresses both abandonment rates against the percentage change in population from 1970 through 2010, according to the following model:

Table 6. Nonproperty Tax Burden

City	Nonproperty Tax Burden 1980	Nonproperty Tax Burden 1990	Nonproperty Tax Burden 2000	Nonproperty Tax Burden 2010
Wilmington	2.936042	2.946129	3.518482	4.276994
Chicago	2.466465	3.349097	2.850062	3.108885
Gary	0.0324096	0.6782299	0.2781064	0.2405253
Baltimore	2.552322	2.292813	2.37955	2.704324
Flint	1.536727	1.670668	0.1271215	1.073105
Detroit	2.445696	3.484062	3.676022	4.421724
Minneapolis	0.4534	0.8766014	0.6832708	1.106562
St. Louis	6.021432	5.815892	6.2888	7.511912
Buffalo	2.715466	3.561513	2.941765	4.034211
Rochester	2.464571	2.742652	2.777777	3.302547
Syracuse	2.406932	2.546031	2.703059	3.699765
Cleveland	3.812825	6.264852	6.556574	7.569623
Cincinnati	3.869091	4.415398	5.184852	5.562505
Toledo	2.397163	3.522784	3.968254	3.587802
Dayton	4.574597	5.730947	5.357946	5.310741
Akron	2.34375	3.196005	3.256422	3.915785
Pittsburgh	2.600438	3.855326	3.789328	4.727581
Philadelphia	6.410045	7.030023	6.741777	8.443435

Source: Lincoln Institute of Land Policy, "Fiscally Standardized Cities Database," http://www.lincolninst.edu/subcenters/fiscally-standardized-cities/.

$$\textit{Abandonment Rate} = \beta_1 + \beta_2 * (\textit{Percentage Change in Population})$$

The second regression regresses the percentage change in population but includes city dummy variables according to the following equation (in which $City_k$ has a value of one if a census tract is in $City_k$ and a value of zero otherwise):

$$\textit{Abandonment Rate} = \beta_1 + \beta_2 * (\textit{Percentage Change in Population}) + \sum_{(k=3)}^{29} \beta_k * City_k$$

In both regressions, we expect the sign of β_2 to be negative—that is, larger population declines should lead to higher abandonment rates. The sign of β_1 would be expected to be positive because even neighborhoods with stable populations would be expected to have some perhaps small rate of abandonment. Including city dummy variables in the second regression captures effects because of factors such as variations in city and state policies that might influence abandonment. Twenty-seven rather than 28 dummy variables are included to prevent collinearity. (A dummy variable for Philadelphia is excluded.)

Table 7 shows results of both regressions. As expected, the percentage change in population is statistically significant at the 1 percent confidence level. (The actual P value is below 0.0005.) The coefficient for percentage change in population when city dummies are excluded implies that a single percentage decrease in population causes an increase of 0.343 percent in a census tract's vacancy rate and an increase of 0.253 percent in its total vacancy plus no-stat rate. The R-squared value is only 0.321 and 0.263 for vacancy and vacancy plus no-stat rates, respectively, which

Table 7. Regression Without City Dummy Variables

Variables	(1) Vacancy Rate	(2) Vacancy and Adjusted No-Stat Rate
Percentage Change in Population, 1970–2010	–0.343***	–0.253***
	(0.00975)	(0.00831)
City Dummies Included?	No	No
Constant	0.586	0.648*
	(0.400)	(0.341)
Observations	2,606	2,606
R-Squared	0.321	0.263

Note: Standard errors in parentheses. *** p<0.01 and * p<0.1
Source: Author's calculations.

means that only about 32.1 percent and 26.3 percent of the variation in abandonment rates between census tracts can be explained by variations in population loss rates.

When city dummy variables for 27 of the 28 cities are included, the percentage change in population remains statistically significant at the 1 percent confidence level, with P values still below 0.0005. Because Philadelphia was omitted, dummy variable coefficients measure the effect that being in a given city has on an abandonment rate *relative* to a census tract in Philadelphia with equal population loss. Coefficients for most cities are also statistically significant and positive, with Detroit, Flint, and Gary having especially large coefficients. A census tract in Detroit is associated with a 17.8 percentage point higher vacancy rate and a 17.4 percentage point higher vacancy plus no-stat rate, compared to a census tract in Philadelphia after controlling for population change by census tract. The respective numbers for Flint are 21.2 and 22.7 percentage points and, for Gary, 16.5 and 17.6 percentage points. No other cities had dummy variable coefficients of more than 10 percentage points.

When city dummies are included, the R-squared value jumps from 32.1 percent to 57.1 percent for the vacancy rate and from 26.3 percent to 51.5 percent for the total vacancy plus no-stat rate. Including city dummies thus nearly doubles the R-squared of the models, suggesting perhaps that variations in city-level variables—such as governmental policies—contribute significantly to abandonment.

Of course, population change is not the only neighborhood-level factor that will likely have a causal effect on residential abandonment rates. Abandonment is a symptom of general neighborhood decline, and decline is marked not only by population loss but also by other factors such as changes in income, demographic composition, and so on. Thus, we expand the neighborhood-change model to include the percentage change in number of housing units from 1970 to 2010, the median household income in 1970, the percentage change in median household income from 1970 to 2010, the percentage of the population that is non-Hispanic white in 1970, the percentage change in the percentage of the population that is white, the percentage with high school diplomas in 1970, the percentage change in the percentage with high school diplomas from 1970, and the number of housing units 30 years or older in 1970. (The poverty rate and the change in poverty rate were excluded due to a high correlation with median household income—including both household income and poverty rates in these models would lead to collinearity.) The reason variables for certain demographic characteristics are included both in their absolute status in 1970 and their relative change from 1970 to 2010 is that while

Table 8. Regression with City Dummy Variables

Variables	(1) Vacancy Rate	(2) Vacancy and Adjusted No-Stat Rate
Percentage Change in Population, 1970–2010	–0.171***	–0.259***
	(0.00700)	(0.00911)
City Dummies Included?	Yes	Yes
Constant	–1.345***	–2.294***
	(0.423)	(0.550)
Observations	2,606	2,606
R-Squared	0.571	0.515

Note: Standard errors in parentheses. *** p<0.01
Source: Author's calculations.

we expect abandonment to reflect neighborhood decline, we would also expect that neighborhoods that declined from relatively low socioeconomic status to begin with would have higher abandonment rates than neighborhoods that declined from a comparatively high status. For example, if neighborhood A's median household income declined from $100,000 to $50,000 while neighborhood B's declined from $30,000 to $15,000, we would likely expect neighborhood B to have a higher abandonment rate, even though both had the same percentage change in their median incomes, because neighborhood A went from high- to middle-income while neighborhood B has stayed at a low-income level.

Thus, we estimate the following two equations; the first does not include city dummy variables, while the second does (Philadelphia is again omitted as a city dummy variable):

$$\textit{Abandonment Rate} = \beta_1 + \beta_2 * (\%\ \textit{Change in Population}) + \beta_3 * (\%\ \textit{Change in Housing Units}) + \beta_4 * (\textit{Median Household Income 1970}) + \beta_5 * (\%\ \textit{Change in Median Household Income}) + \beta_6 * (\%\ \textit{White in 1970}) + \beta_7 * (\%\ \textit{Change in \% White}) + \beta_8 * (\%\ \textit{High School Diplomas}) + \beta_9 * (\%\ \textit{Change in \% High School Diplomas}) + \beta_{10} * (\%\ \textit{Housing Units 30 Years or Older})$$

$$\textit{Abandonment Rate} = \beta_1 + \beta_2 * (\%\ \textit{Change in Population}) + \beta_3 * (\%\ \textit{Change in Housing Units}) + \beta_4 * (\textit{Median Household Income 1970}) + \beta_5 * (\%\ \textit{Change in Median Household Income}) + \beta_6 * (\%\ \textit{White in 1970}) + \beta_7 * (\%\ \textit{Change in \% White}) + \beta_8 * (\%\ \textit{High School Diplomas}) + \beta_9 * (\%\ \textit{Change in \% High School Diplomas}) + \beta_{10} * (\%\ \textit{Housing Units 30 Years or Older}) + \sum_{(k=11)}^{37} \beta_k * \textit{City}_k$$

As before, we expect the coefficient on the percentage change in population to be negative. The coefficients for median household income and the percentage change in median household income should also both be negative; neighborhoods that were wealthier in 1970 should have lower abandonment rates because residents would have more money to maintain their homes, pay property taxes, and so on. Likewise, neighborhoods that experienced larger income declines would be expected to have residents increasingly unable to do these aforementioned things. The coefficient on percentage of whites in 1970 and the percentage change in percentage white should be negative because of the "white flight" phenomenon—many neighborhoods saw an exodus of white residents during this 40-year period, and many of the homes they vacated likely became abandoned

Table 9. Expanded Regression with City Dummy Variables

Variables	(1) Vacancy Rate	(2) Vacancy and Adjusted No-Stat Rate
Percentage Change in Population, 1970–2010	–0.258***	–0.328***
	(0.0156)	(0.0182)
Percentage Change in Housing Units, 1970–2010	0.00117	0.00783
	(0.0125)	(0.0146)
Median Household Income, 1970 (2010 Dollars)	0.000108***	0.000103***
	(1.65e-05)	(1.93e-05)
Percentage Change in Median Household Income, 1970–2010	–0.0247***	–0.0283***
	(0.00399)	(0.00467)
Percentage White in 1970	0.00758	–0.000825
	(0.00526)	(0.00616)
Percentage Change in Percentage White, 1970–2010	–0.00111***	–0.00148***
	(0.000409)	(0.000479)
Percentage with High School Diplomas in 1970	0.00997	0.0207
	(0.0164)	(0.0192)
Percentage Change in Percentage with High School Diplomas, 1970–2010	0.115***	0.140***
	(0.0117)	(0.0138)
Percentage of Housing Units 30 Years or Older, 1970	0.0382***	0.0709***
	(0.00702)	(0.00823)
Constant	(1.909)	(2.237)
City Dummies Included?	No	No
Observations	2,605	2,605
R-Squared	0.384	0.435

Note: Standard errors in parentheses. *** p<0.01
Source: Author's calculations.

over time. The percentage of housing units 30 years or older should have a negative coefficient because, as Rosenthal noted, affluent groups prefer newer housing and will over time leave older neighborhoods for newer ones.[37] The coefficient of the percentage change in housing units could be ambiguous—if more homes are built in a census tract, more homes have the potential to become abandoned, which could lead to a positive coefficient. However, in declining neighborhoods, homes may be demolished over time as population decreases, which could actually lower the abandonment rate—a structure must still exist before it can be abandoned.

Results from the first regression, without city dummy variables, are shown in Table 9. As expected, the percentage change in population is significant at the 1 percent confidence level; a 1 percent decline in population results in an increase of 0.258 percent in the vacancy rate and 0.328 percent in the vacancy and adjusted no-stat rate. Median household income and the percentage change in it are also significant at the 1 percent level. While income surprisingly has a positive coefficient, it

Table 10. Expanded Regression with City Dummy Variables

Variables	(1) Vacancy Rate	(2) Vacancy and Adjusted No-Stat Rate
Percentage Change in Population, 1970–2010	–0.125***	–0.190***
	(0.0138)	(0.0176)
Percentage Change in Number of Housing Units, 1970–2010	0.00496	0.00961
	(0.0103)	(0.0131)
Median Household Income, 1970 (2010 Dollars)	4.49e-05***	4.31e-05**
	(1.36e-05)	(1.74e-05)
Percentage Change in Median Household Income, 1970–2010	–0.0124***	–0.0177***
	(0.00319)	(0.00406)
Percentage White in 1970	–0.0154***	–0.0229***
	(0.00460)	(0.00587)
Percentage Change in Percentage White, 1970–2010	–0.000569*	–0.000932**
	(0.000314)	(0.000400)
Percentage with High School Diplomas in 1970	0.0458***	0.0487***
	(0.0131)	(0.0167)
Percentage Change in Percentage with High School Diplomas, 1970–2010	0.0870***	0.122***
	(0.00967)	(0.0123)
Percentage of Housing Units 30 Years or Older, 1970	0.0768***	0.112***
	(0.00564)	(0.00718)
Constant	–7.366***	–8.668***
	(1.540)	(1.963)
City Dummies Included?	Yes	Yes
Observations	2,605	2,605
R-Squared	0.644	0.614

Source: Author's calculations. *** p<0.01 , ** p<0.05, * p<0.1

is quite small; a $1,000 increase in median household income in 1970 would be expected to increase the two abandonment measures by just 0.1 percent. The percentage change in median household income has the expected negative coefficient with a much larger magnitude. The percentage of housing units more than 30 years old has a positive coefficient and is also significant at the 1 percent confidence level; an increase of 10 percent in the number of units more than 30 years old in 1970 increases the expected vacancy rate by 0.3 percent and the expected vacancy plus no-stat rate by 0.7 percent. However, the percentage change in population still has by far the largest magnitude of its coefficient even when including these other variables. Compared to the regression just using population change, the R-squared of this model has increased from 0.321 to 0.384 for the vacancy rate and from 0.263 to 0.435 for the vacancy plus no-stat rate. Thus, including other variables accounting for neighborhood change does increase the explanatory power of the model.

Table 10 shows results of the second regression, which includes city dummy variables. Again, the

R-squared values of the models significantly increase from the regression including just city dummies and the change in population and are now above 0.6, meaning that more than 60 percent of the variation in abandonment rates can be explained by the variables in this regression. The large increase in R-squared value from the model excluding city dummies again suggests that variations in city policies significantly affect abandonment. Coefficients on the city dummy variables are again especially large for Gary, Detroit, and Flint, suggesting that census tracts in these three cities have much higher abandonment rates than can be explained by the other variables alone.

The percentage change in population remains statistically significant at the 1 percent confidence level, although the magnitude of its coefficient decreases by roughly half for each measure of abandonment once city dummies are included. On the other hand, the coefficient for the percentage of homes 30 years older (which is still significant at the 1 percent level) roughly doubles. The percentage of residents who are white was not significant at even the 10 percent level without city dummies, but once dummies are included, it becomes statistically significant at the 1 percent level. All else being equal, a 1 percent increase in the percentage of a tract's population that is white in 1970 decreases its vacancy rate by 0.015 percent and its vacancy plus no-stat rate by 0.0229 percent, as might be expected by the white flight phenomena. Still, the percentage change in population and percentage of housing units more than 30 years old have by far the largest coefficients.

Including Changes in Citywide Policies. The substantial increase in R-squared values once city dummies are included, as well as the high coefficients on certain city dummies such as Detroit and Flint, suggests that merely being located inside certain cities' boundaries has a significant effect on abandonment rates. As previously discussed, prior literature on abandonment has found that variations in citywide policies such as high property tax rates can significantly contribute to abandonment. To explore the extent to which city tax and spending burdens affect abandonment, we add the following variables to the model: a city's average property tax burden as a percentage of median home values, the average burden of all other taxes as a percentage of per capita income, a city's average educational spending per capita, a city's average violent crime rate, a city's average property crime rate, and a city's average debt levels per capita. All averages are taken over the period from 1980 to 2010, which are the years from which data are available. We estimate this regression without city dummy variables for both measures of abandonment (the vacancy rate and the adjusted no-stat rate), according to the following equation:

$$\textit{Abandonment Rate} = \beta_1 + \beta_2 * (\textit{\% Change in Population}) + \beta_3 * (\textit{\% Change in Housing Units}) + \beta_4 * (\textit{Median Household Income 1970}) + \beta_5 * (\textit{\% Change in Median Household Income}) + \beta_6 * (\textit{\% White in 1970}) + \beta_7 * (\textit{\% Change in \% White}) + \beta_8 * (\textit{\% High School Diplomas}) + \beta_9 * (\textit{\% Change in \% High School Diplomas }) + \beta_{10} * (\textit{\% Housing Units 30 Years or Older}) \beta_{11} * (\textit{Average Property Tax Burden}) + \beta_{12} * (\textit{Average Other Tax Burden}) + \beta_{13} * (\textit{Average Educational Spending Per Capita}) + \beta_{14} * (\textit{Average Property Crime Rate}) + \beta_{15} * (\textit{Average Violent Crime Rate }) + \beta_{16} * (\textit{Average Debt Levels Per Capita})$$

Including city policies in the estimated equation should not change the expected signs on any of the already-included coefficients. We expect the average coefficients on the average property tax burden and the average burden of other taxes to be positive—higher tax burdens should lead to higher abandonment rates. In the case of property taxes, this result has already been found by Scafidi et al.[38] and Arsen.[39] We would also expect the coefficient on the other tax burden to be positive because higher taxes in other areas reduce the amount of money that residents have to maintain their homes, pay property taxes, and so on; however, we expect a lower coefficient on the other tax burden than the property tax burden because inability to pay property taxes is a direct factor leading people to abandon their homes. Higher rates of both property and violent crime should lead to higher abandonment rates, but we might expect a higher coefficient on the property crime rate because it can more directly lead

Table 11. How Variations in Citywide Policies Affect Abandonment

Variables	(1) Vacancy Rate	(2) Vacancy and Adjusted No-Stat Rate
Percentage Change in Population, 1970–2010	–0.145***	–0.236***
	(0.0159)	(0.0195)
Percentage Change in Number of Housing Units, 1970–2010	–0.00510	0.0162
	(0.0121)	(0.0148)
Median Household Income, 1970 (2010 Dollars)	6.36e-05***	4.87e-05**
	(1.58e-05)	(1.94e-05)
Percentage Change in Median Household Income, 1970–2010	–0.0169***	–0.0205***
	(0.00383)	(0.00471)
Percentage White in 1970	–0.0116**	–0.0141**
	(0.00522)	(0.00641)
Percentage Change in Percentage White, 1970–2010	–0.000589*	–0.000991**
	(0.000352)	(0.000432)
Percentage with High School Diplomas in 1970	0.0248	0.0290
	(0.0151)	(0.0186)
Percentage Change in Percentage with High School Diplomas, 1970–2010	0.0978***	0.132***
	(0.0113)	(0.0138)
Percentage of Housing Units 30 Years or Older, 1970	0.0520***	0.0844***
	(0.00647)	(0.00794)
Average Property Tax Burden	13.17***	10.27***
	(0.823)	(1.011)
Average Other Tax Burden	0.0679	–0.0376
	(0.0941)	(0.116)
Average Violent Crime Rate (Per 100,000 Residents)	0.00680***	0.00731***
	(0.000483)	(0.000594)
Average Property Crime Rate (Per 100,000 Residents)	–0.000131	0.000195
	(0.000188)	(0.000231)
Average Education Expenditure Per Capita	–9.32e-05	0.000968
	(0.000615)	(0.000755)
Average Outstanding Debt Per Capita	–0.000377***	–0.000381***
	(0.000110)	(0.000135)
Constant	–20.25***	–21.55***
	(2.359)	(2.898)
Observations	2,244	2,244
R-Squared	0.581	0.576

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: Author's calculations.

to property decay. The average debt level per capita is used as a rough proxy for how well a city manages its finances and its affairs more generally. Higher debt levels mean a city has fewer financial resources with which to perform its basic duties of education, safety, and so on, which should lead to neighborhood decline and thus higher abandonment.

Results of the regression are shown in Table 11. Again, the percentage change in population and the percentage of homes 30 years or older are significant at the 1 percent confidence level and are the most significant neighborhood-change variables in the magnitudes of their coefficients. Among the city policy variables, the average property tax burden is statistically significant with P values below 0.005 for both measures of abandonment. The coefficients suggest that an increase in property tax rates equivalent to 1 percent of a neighborhood's median home value would be expected to increase its vacancy rate by 13.17 percentage points and its vacancy plus no-stat rate by 10.27 percentage points. While an increase of 1 percent would be relatively large, it is well within the realm of variation in property tax rates in the cities considered here. For instance, the average census tract examined here has an average property tax burden of 0.99 percent, whereas the average property tax burden of a Detroit census tract has a property tax burden of 1.37 percent. Quick calculations estimate that had Detroit imposed a property tax burden at the 0.99 percent average, the average Detroit census tract would have a vacancy rate of 19.2 percent, rather than the current rate of 24.3 percent, and a vacancy and adjusted no-stat rate of 23.1 percent, rather than 27.0 percent.

The average violent crime rate and average outstanding debt per capita are also statistically significant at the 1 percent level. The coefficient on the average violent crime rate has the expected positive sign. The average violent crime rate is measured per 100,000 residents, with a minimum of 250 and a maximum of 2,372. Thus, a "realistic" reduction in the violent crime rate of, say, 300 per 100,000 rates, would be expected to reduce the vacancy rate by 2.04 percentage points and the vacancy and adjusted no-stat rate by 2.19 percentage points. Violent crime rates do therefore have a sizable impact on abandonment rates, even though their impact is much smaller than the impact of property tax burden rates. The coefficient on average outstanding debt per capita is, contrary to expectations, negative. But the extremely small coefficients (–0.000371 and –0.000381) suggest that the actual impact of outstanding debt per capita on abandonment rates is almost negligible. Property crime rates and educations expenditures were not statistically significant even at the 10 percent significance level.

Conclusion

Using 2010 census-tract boundaries, this paper compiled and combined current data on residential home abandonment with past data on economic and demographic characteristics of these tracts from censuses going back through 1970. Two separate measures of abandonment rates at the census-tract level were used, based on various classifications of occupancy status used by USPS mail carriers, and both rates were estimated using the same models. The first model regressed the abandonment rates against a mixture of economic and demographic characteristics of the census tracts as they stood in 1970, as well as the relative change of these characteristics over the period from 1970 through 2010. Results indicated that the percentage change in population and the percentage of housing units that were 30 years or older in 1970 were the most important determinants of abandonment rates. This finding was consistent with previous literature finding that older housing was more likely to be abandoned because affluent residents prefer newer structures.

The second model added to these economic and demographic characteristics several variables reflecting city policies either directly or indirectly, such as tax burdens on residents, crime rates, and debt levels per capita. Among these policies, property tax rates were strongly significant both statistically and economically—a 1 percentage point increase in average property tax burdens over the period from 1970 to 2010 increases abandonment rates by just over 13 percentage points using one measure or by just over

10 percentage points using the other. Among other policy variables, violent crime rates and outstanding debt per capita were also statistically significant; however, the coefficient on outstanding debt per capita was extremely small, meaning debt levels have a miniscule if not negligible impact on abandonment rates.

These results have some clear limitations. The first is that data on these census tracts using the 2010 census boundaries were only available going back to 1970. However, most census tracts in these cities started witnessing population loss and other signs of neighborhood decline in the 1950s and 1960s, and so the measurements of neighborhood change in this paper "miss" some of the initial decline in these neighborhoods. Nevertheless, neighborhoods that declined most strongly post-1970 will also likely be those that declined most strongly pre-1970, so this limitation should not significantly affect the results obtained.

Another limitation is that the data here were taken from a specific group of cities: medium- and large-sized municipalities in the Northeast and Midwest that have experienced large population declines. As such, the results of the analyses here give us an idea of how demographic and economic changes or city policies affect abandonment rates only in cities that have experienced similar declines. The estimate that a 1 percent increase in property tax rates as a percentage of the median home value leads to a 13.2 percentage point increase in abandonment rates, for instance, only realistically applies to similar Rust Belt cities with declining populations. It would not be expected that a 1 percentage point increase in the property tax burden in an affluent suburb with a stable population, for example, would lead to a sudden plague of residential abandonment.

In the case of Detroit, the city's abandonment certainly results in large part from its massive hemorrhaging of population. Furthermore, abandonment is most concentrated in older neighborhoods just beyond the city core, where the housing stock is oldest,[40] consistent with the finding here that an older housing stock contributes to higher abandonment rates. However, the findings here also build on findings elsewhere that Detroit's city policies have played a role in fomenting abandonment. The city has had higher-than-average property tax rates for decades, and this property tax burden worsens year by year as home values decline and the city must try to squeeze out revenue from an increasingly small tax base. An increasing number of homeowners in Detroit thus find themselves in the position in which it is more attractive to abandon their home rather than try to sell it or continue to pay increasingly burdensome property taxes.[41] Going forward, Detroit may see a worsening abandonment problem if it maintains its current tax regime.

Notes

1. *National Geographic*, "Rethinking Detroit," http://www.nationalgeographic.com/taking-back-detroit/explore-detroit.html.

2. Kate Abbey-Lambertz, "These Are the American Cities with the Most Abandoned Houses," Huffington Post, February 13, 2016, http://www.huffingtonpost.com/entry/cities-with-most-abandoned-houses-flint_us_56be4e9ae4b0c3c550517 1e7.

3. William Spelman, "Abandoned Buildings: Magnets For Crime?," *Journal of Criminal Justice* 21, no. 5 (February 1993): 481–95.

4. Smart Growth America, "Vacant Properties: The True Costs to Communities," National Vacant Properties Campaign, 2005, 1–9, https://www.smartgrowthamerica.org/app/legacy/documents/true-costs.pdf.

5. Benjamin P. Scafidi et al., "An Economic Analysis of Housing Abandonment," *Journal of Housing Economics* 7, no. 4 (1998): 289–90.

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