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Spatial characteristics of housing abandonment

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A B S T R A C T

This study investigates whether the probability of housing abandonment is influenced by spatial factors. Using indicators of spatial autocorrelation, the study finds that housing abandonment and the predictors of abandonment exhibit statistically significant clustering. More importantly, by comparing a multilevel regression model that does not account for spatial relationships to one that does, the study finds that accounting for spatial relationships significantly improves the ability to predict abandoned housing. Additionally, the study shows that in some cases, conditions in surrounding neighborhoods have a greater influence on the probability of housing abandonment than do conditions in the neighborhood itself.

Introduction

Abandoned houses are a significant problem, especially in cities facing population loss. Among other challenges, these houses decrease property values and harbor crime (Cohen, 2001; Skogan, 1990; Spelman, 1993; Temple University, 2001). As a result, some studies have attempted to assist municipalities in predicting abandoned housing under the notion that if policy makers can predict abandonment, they can better act to prevent it (Bassett, Schweitzer, & Panken, 2006; Hillier, Culhane, Smith, & Tomlin, 2003; Mardock, 1998; Morckel, 2013). This study builds upon existing models by considering the spatial elements of housing abandonment, including whether conditions in surrounding neighborhoods predict the probability of abandonment in a neighborhood of interest.

Using exploratory factor analysis, Morckel (2013) found that three factors predict housing abandonment at the neighborhood level: market conditions, gentrification, and physical neglect. The dataset and factors used in Morckel (2013) were adopted for this study given the utility of factors—the ability to think about abandonment in terms of a small number of constructs. The market conditions factor includes the percentage of foreclosures the year prior, the percentage of properties below the city-wide median property value, and the percentage of properties not sold the year prior. The gentrification factor includes the percentage of properties built prior to 1945, the percentage of residents over 65 years of age, the percentage of residents 25 years and older without a bachelor's degree or higher, and the percentage of residents who are in poverty. Finally, the physical neglect factor includes the percentage of properties that were tax delinquent the year prior, the percentage of properties rated as being in either "poor" or "bad" condition by city officials, the percentage of residents who are unemployed, the percentage of properties demolished the year prior, and the percentage of residents who identify as black alone or in combination. Table 1 shows the variables that comprise the factors, as well as their factor loadings. Morckel (2013) provides a detailed literature review of these variables and factors, and why they are thought to predict abandonment.

Despite a prevailing belief that abandoned houses cluster and spread, there is limited empirical evidence demonstrating this to be the case. A survey study by Accordino and Johnson (2000) found that within ninety-nine cities (two-thirds of their sample) vacant and abandoned properties were confined to specific neighborhoods or areas, rather than scattered throughout the city. While Accordino and Johnson did not test for spatial dependence, the results of their study support the notion that there might be statistically significant hot spots or clusters of abandonment. Wilson, Margulis, and Ketchum (1994), compared the proportion of houses abandoned over two time periods (1980 and 1990) in Cleveland to show evidence of the spreading of housing abandonment. While they did not test for clustering, presumably abandonment has to spread from something—a cluster. Hillier et al. (2003) also acknowledged the likely clustering of abandonment. They randomly sampled 1000 homes for inclusion in their study to reduce the likelihood of a cluster of abandoned homes from appearing in the dataset, thus minimizing the statistical violation of independence of observations.

Since very little work has been conducted on the spatial aspects of abandonment, theories for why abandonment might cluster lack

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Table 1
Factors and rotated factor loadings [new].

Item	Factor		
	1	2	3
% Foreclosures the year prior	.742		
% Properties below the city-wide median property value	.648		
% Properties not sold the year prior	−.482		
% Properties built prior to 1945		.682	
% RESIDENTS over 65 years of age		−.674	
% 25 and older without a bachelor's degree or higher		−.438	
% Residents who are in poverty		.400	
% Properties tax delinquent the year prior			.822
% Properties rated as either "poor" or "bad" condition by city officials			.714
% Residents who are unemployed			.589
% Properties demolished in the year prior			.581
% Residents who identify as black alone or in combination			.433

Note: factor 1 = market conditions, factor 2 = gentrification, factor 3 = physical neglect.

in the literature. This author suspects that abandoned houses cluster because the predictors or causes of abandonment cluster. While no study has specifically examined whether the factors found in Morckel (2013) cluster, there is evidence that some of the variables that comprise the factors cluster. For example, there is emerging spatial research demonstrating that foreclosures cluster and spread (Baumer, Arnio, & Wolff, 2013; Goodstein, Hanouna, Ramirez, & Stahel, 2011). It makes intuitive sense that property values and property ages would cluster, since most of the houses in a neighborhood are built around the same time with similar specifications and styles. Another potential explanation is that abandoned houses cluster due to low location-specific housing demand (Bender, 1979). Scafidi, Schill, Wachter, and Culhane (1998) found that abandoned buildings tend to be located more frequently in distressed neighborhoods with high poverty rates. Since it is well established that social characteristics like unemployment, poverty, and race geographically concentrate, it follows that if these variables predict abandonment, abandonment would also geographically concentrate.

Why characteristics in surrounding neighborhoods would influence the probability of abandonment in a given neighborhood is less intuitive. Perhaps there is an "anticipation effect" whereby property owners anticipate that the neighborhood will decline based on what is happening in nearby neighborhoods; they therefore abandon early in an effort to minimize losses. Such a phenomenon would be similar to white flight in the 1950s and 1960s, where many white homeowners sold their homes in anticipation of an influx of black residents (Frey, 1979). While this study cannot prove that an "anticipation effect" is the cause of abandonment, if surrounding neighborhood conditions impact the probability of abandonment, then this finding would lend support to such a notion.

The Morckel (2013) dataset contains data for 382 neighborhoods in the city of Columbus, Ohio and 80 neighborhoods in the city of Youngstown, Ohio, with neighborhoods operationally defined as census block groups. Columbus neighborhoods in this study average 985 residents, while Youngstown neighborhoods average 838 residents. These population sizes fit one of the "critical membership" ranges of community (400–1500 persons) whereby the size is small enough "… that members can associate with one another on a regular basis, provide mutual aid, and have open and trusting social relations" (Brower, 2011, p. 18). Likewise, block groups are suitable analogs for neighborhoods. However, the reader should keep in mind that there are many different ways to define a neighborhood, with the appropriateness of definition dependent upon the purpose.

Similarly, there is no agreed upon operational definition of abandonment in the literature. Due to data availability, abandonment was operationally defined as follows: For Columbus, an abandoned property is one that appears on the city's Vacant Housing Application (VHA) database maintained by the code enforcement office. Although this database uses the word "vacant," the properties on the list are abandoned properties. Annually, the city code enforcement office documents all of the chronically vacant (i.e. abandoned) properties in the city. A house that is for sale, for rent, or just completed but not occupied would not appear on this list (M. Farrenkopf, personal communication, December 14, 2011). In March 2011, the author received the most recent update of the survey conducted in January 2011. For Youngstown, an abandoned property is a vacant structure rated B–F on the Property Inventory and Condition Survey of 2010, a survey conducted by the Mahoning Valley Organizing Collaborative (MVOC)—a community organization dedicated to improving the quality of life in urban neighborhoods in the Youngstown region. Youngstown identifies structures and lots as vacant if at the time of the survey there are obvious visible signs that a property was not presently occupied or being used and maintained. The survey ratings range from "A" (the structure could easily be reoccupied) to "F" (the structure is an immediate hazard to the neighborhood) (Mahoning Valley Organizing Collaborative, 2011).

Since many cities in Ohio face abandoned property problems (Community Research Partners and Rebuild Ohio, 2008), using data from Ohio cities is appropriate. The City of Youngstown, in particular, received notice in the planning community due to its innovative 2010 plan that embraced the notion of planning for a shrinking city (Pallagst, 2009). Although Columbus' population is growing as a whole, the portions of the city within its 1950 boundary face population losses and accompanying challenges comparable to other cities in Ohio (The Columbus and Franklin County Consortium, 2009). It is useful to consider both of these cities when creating prediction models since one (Youngstown) faces a city-wide abandonment problem, while the other (Columbus) does not. By examining more than one city, generalizability of results is improved.

Thus, building on existing research, this study will use spatial statistics to determine if there is statistically significant clustering of abandoned housing and its predictors. The study will account for spatial relationships by spatially lagging the appropriate variables and adding them as additional independent variables in a multilevel regression model. Among other benefits, adding the spatially lagged terms to the model will provide a metric as to how conditions in nearby neighborhoods influence the probability of abandonment. Finally, the study will determine whether the spatial effects that emerge are the same for the two cities of interest.

Methods

Non-spatial, multilevel models take into account *place*, not space. These models consider the neighborhood affiliation of the individual house, but disregard the spatial connections between neighborhoods (Chaix, Merlo, Subramanian, Lynch, & Chauvin, 2005). Accounting for spatial dependence is important for if there is positive spatial autocorrelation, the regression will tend to underestimate the real variance in the data since the standard errors of the parameter estimates are biased downward. Consequently, decision errors are more likely to be made (Ward & Gleditsch, 2008). In a sense, the model "thinks" it is receiving more information from the observations than it actually is, inflating the value