Mature Suburbs, Property Values, and Decline in the Midwest? The Case of Cuyahoga County

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Abstract

For most U.S. homeowners, a home represents the biggest investment they will ever make, and until recently, most expected the value of their property to rise. If the mature suburbs in which many of these homeowners live have problems or are in decline, property values could decrease and investment value will be lost.

We define mature suburbs for Cuyahoga County, OH (the Cleveland area), and analyze the property values of single-family homes there. We examine how property values have behaved in mature suburbs compared with the central city and developing suburbs and analyze specific factors that have influenced the property value of single-family homes in these three submarkets from 1985 to 2000. Our analyses show that there is no overall decline in nominal property values. Housing space, nearness to workplaces and transportation networks, and tax rates are important variables in the model, affecting mature suburbs and developing suburbs differently.

Keywords: Location; Prices; Suburbs

Introduction

With almost 70 percent of households owning a home and more than 50 percent residing in the suburbs, the United States is a nation of suburban homeowners (Alba and Logan 1991; Berger 1960; Dobriner 1963; Douglas 1925; Guest 1971; Harris 1943; Lake 1981; Logan and Golden 1986; Mieszkowski and Mills 1993; Mills and Price 1984; Muller 1981; Nicolaides and Wiese 2006; Orfield 2002; Pinkerton 1969; Puentes and Warren 2006; Schnore 1956, 1957, 1963, 1972; Schnore and Sharp 1963; Teaford 2008; Wood 1958, 1972). The enormous investment of homeownership is important

both to homeowners and to the communities in which they live (Morrow-Jones, Irwin, and Roe 2004). Any risk of decline in communities and their property values is a serious policy concern. As noted in much of the recent literature, older suburbs—called mature suburbs throughout this article—are at particular risk of decline (Bier 1991, 2001; Bier and Howe 1998; Howe et al. 1998; Hudnut 2003; Lucy and Phillips 1995, 1997, 2000, 2001a, 2001b; Orfield 2002; Puentes and Orfield 2002; Puentes and Warren 2006).

In the Midwest, this risk of decline is a particular problem in metropolitan areas where the central city has a declining population and where the entire metropolitan area is stagnant or declining as well. Residents' outward movement requires public investment in infrastructure at the urban fringe, even though such infrastructure is already in place in the central cities and inner suburbs. This replication of infrastructure is inefficient (Howe et al. 1998).

In general, older suburbs in the Midwest might be expected to decline for many of the same reasons as central cities (older housing, weakening school districts, demographic change, etc.), but they have fewer resources to fall back on if they do. Older suburbs have lower tax revenues, smaller staffs, and so on, and they are eligible for far less federal money for redevelopment.

If mature suburbs decline, we expect property values to be affected. This, in turn, affects municipal tax revenues and services such as schools, parks, and roads. A municipality might then have problems meeting mandates set by the public sector, as well as residents' expectations. It will become more difficult to keep homeowners, to attract potential home buyers, and to encourage homeowners to make investments in their homes. Property values could cycle downward.

Many central-city neighborhoods have experienced an out-migration of middle-income households, an in-migration of lower-income households, and filtering (Bradford and Kelejian 1973; Ellen 2000; Guest 1972; Guterbock 1976; Palen 1998). These factors, among others, have affected property values. It is commonly assumed that real value has either remained stagnant or declined in many central-city neighborhoods since the 1950s (Berry 1985; Bier and Post 2003; Gale 1979; Glass 1964; Grebler 1952; Hoyt 1960; Lowry 1960; Ratcliff 1949; Sternlieb 1969; Sternlieb and Burchell 1973; Sternlieb et al. 1974; Varady 1986; Wilson, Margulis, and Ketchum 1994; Wyly and Hammel 1999).[1] Until the 1990s, it was also commonly assumed

[1]Exceptions are those select neighborhoods that have experienced the movement of suburban residents back toward the central city (Belmont 2002; Bunnell 2002; Ezell 2004, 2006; Florida 2005; Gratz and Mintz 1998; Grogan and Proscio 2000; Hinshaw 1999; Leinberger 2008; Zukin 1989).

that residential property values in all suburbs had been appreciating. Recent studies have shown this assumption to be false, especially for older suburbs (Bier 1991, 2001; Bier and Howe 1998; Howe et al. 1998; Hudnut 2003; Lucy and Phillips 1995, 1997, 2000, 2001a, 2001b; Orfield 2002; Puentes and Orfield 2002; Puentes and Warren 2006), as have very recent studies that have focused on the subprime lending and foreclosure crisis (Carr 2007, among others).

A variety of labels have been used interchangeably in the literature to describe older suburbs (Hudnut 2003). So far, there is no generally accepted definition.[2] Not all troubled suburbs are mature, and not every mature suburb is a troubled one (Fernandez and Pincus 1982; see also Bollens 1988 and Mikelbank 2004, 2006).

The primary objective of our research, which uses data from Cuyahoga County—the central county in the Cleveland metropolitan area—is to examine appreciation rates and the impact that certain variables have on property values in mature suburbs. The variables derive from theories about property values and neighborhood change.

We begin by specifying our definitions of decline and of mature suburbs and describe the literature and theory pertaining to them. We then go on to examine how the property values of single-family homes have behaved in the mature suburbs in our case study compared with the central city and its developing suburbs. Next, we test specific factors that might influence the property values of single-family homes in mature suburbs versus single-family homes in central cities and developing suburbs.

Researchers have used a variety of different labels for and measures of decline. Some, such as Lucy and Phillips (2000), Orfield (2002), and Puentes and Warren (2006), use resident-related socioeconomic variables (see also Bier and Howe 1998). Others, such as Bier (2001) and Margulis (2002), use housing-related variables. An example of a resident-related socioeconomic variable is average household income. There are several potential issues involved in using this variable to analyze suburban decline, however. The proportion of one-person households in the United States has increased over time (U.S. Bureau of the Census 1990 and 2000). Typically, households with

[2]Mature suburbs (Listokin and Beaton 1983) are also often called first-ring suburbs (Rokakis and Katz 2001), inner-ring suburbs (First Suburbs Consortium Housing Initiative 2002), inner-ring cities (Advisory Commission on Intergovernmental Relations 1984), inner suburbs (Sutker 1974), first suburbs (Puentes and Orfield 2002; Puentes and Warren 2006), first-tier suburbs (Hudnut 2003), older suburbs (Kotkin 2001; Lucy and Phillips 2001a, 2006, among others), and older hubs (Listokin and Beaton 1983).

one wage earner have lower household incomes than those with several wage earners, and a decrease in the number of earners could produce a decrease in average household income. Taking household income as the key measure of suburban decline is therefore not ideal. A decrease in household income does not necessarily translate into suburban decline—it might reflect merely a broader societal trend or a younger population that will age into higher incomes. In addition, while new households might have lower incomes than the households they are replacing, this might reflect only their life cycle stage (younger) rather than their overall socioeconomic status.

A better alternative to using household income as a measure of decline is using a housing-related variable such as the sale price for housing units sold—the variable selected for this research. Housing units are fixed in space, and their prices reflect the characteristics of their surroundings, as well as the characteristics of the unit and competing options. They are not directly influenced by the characteristics of in-movers and out-movers per se. They are also durable and not easily changed, making them a more stable measure. Further, sale prices are readily available in general and for specific geographic areas, and the data are more current than most measures of household income. Therefore, this study will use the sale prices of housing units to measure change.

Literature review: Models of urban change

Human ecology and urban economic models predict the continual outward growth of urban areas. Such growth is typically driven by upper- and middle-income households moving from more central communities to more outlying ones. However, people who have fewer locational choices often remain in central-city neighborhoods where housing prices have filtered down enough to be affordable. Many of these inner neighborhoods have had problems, sometimes severe ones. Theories about the process of decline fall into two groups: those that focus primarily on land use and those that stress land values, house prices, and rents.

Theories that focus primarily on land use were suggested first by Burgess (1924, 1925), Hoyt (1939), and Harris and Ullman (1945), among others. Spatial theories that stress land values, house prices, and rents are based on work by Alonso (1964), Muth (1969), and Mills (1972), among others. Monocentric and polycentric models (e.g., Anas, Arnott, and Small 1998; Brueckner, Thisse, and Zenou 1999; Cervero and Wu 1998; Downs 1970; Heikkila et al. 1989; Hohenberg and Lees 1986; LeRoy and Sonstelie 1983; McMillen 2001; Wasylenko 1984; Wheaton 1977) suggest both that cit-

ies typically expand outward and that residents with higher incomes move outward, although there are exceptions. This continued movement to the urban fringe raises the question of whether the existence of jurisdictional boundaries and fragmentation will interfere with the way the models play out or whether each successive layer of suburbs will face decline in the future as some inner-city neighborhoods have in the past. The expectation is that suburban decline would be less likely to lead to renaissance because of fewer resources and weaker institutional capabilities in these communities (Orfield 2002).

The basic theories were suggested decades ago when central cities and their neighborhoods were the focus. Mature suburbs have since moved into the academic limelight, and they may now be Burgess's (1924, 1925) zone of deterioration.

This article builds on the literature we have cited to understand where mature suburbs stand in terms of property values and appreciation rates compared with central cities and developing suburbs. The article goes on to examine variables that will help us determine whether processes at work in mature suburbs are similar to those pointed out by previous studies for central cities.

Defining mature suburbs

Definitions of mature suburbs have been scarce and inconsistent in the literature, but it is important to clarify what we mean when we use the term. The following discussion will introduce a variety of terms that overlap and are sometimes used interchangeably. From that discussion, we will derive our definition.

Fernandez and Pincus (1982) suggested the following indicators of a suburb in trouble:

1. Deteriorating physical plant and low or deteriorating quantity and quality of public services
2. Persistent inability to finance the municipal budget except by borrowing or high tax rates that drive out residents and businesses
3. Rapid demographic change, which may lead to social problems such as discrimination, higher crime rates, poverty, and flight
4. Relative economic decline or low-level stability, measured by per capita income and change in per capita income and by decline of local manufacturing services and trade

These indicators are insightful, but many are difficult to measure and data are difficult to collect, especially in a consistent fashion for multiple communities over time.

Bier (1991) suggested that declining suburbs are characterized by homes with low property values, low household incomes, and adjacency to their central city. In a later study, Bier (2001) noted that many declining suburbs have a small number of residents, some structures in need of maintenance and/or repair, a lack of resources beyond their own tax base, and a lack of political power. More specifically, he defined Cleveland's first suburbs as follows:

1. They are fully developed and have no vacant land for new construction, thereby creating tax base issues.
2. They experience no population growth.
3. The housing stock is at least 50 years old on average.
4. They have an infrastructure that is relatively dense and old, requiring extensive maintenance.[3]
5. They have lower growth in incomes and property values than newer outer suburbs (Thomas Bier, e-mail dated May 28, 2003).

Lucy and Phillips (1995, 1997, 2000, 2001a, 2001b, 2006), starting their data analysis with the year 1960, examined suburban decline in 554 suburbs in the 24 most populous urban areas. Pointing out that decline has many dimensions, they argue that the decline in family or household income in the suburbs relative to metropolitan levels is a good indicator of suburban decline. They point out that another potential indicator might be race, because blacks as a group have lower incomes than non-Hispanic whites. Thus, increases in the proportion of blacks in the suburbs might be synonymous with relative declines in income.

Orfield (2002) argued that many suburbs are beginning to experience rapid socioeconomic changes yet lack the resources to deal with them. He suggested using several measures of municipal fiscal characteristics (e.g., revenue capacity and expenditure needs) and several measures of sociopolitical environments to analyze socioeconomic changes. Examples of his measures are 1998 tax capacity per household and growth in tax capacity from 1993 to 1998. He also uses proportion of elementary students eligible for a free- or reduced-price lunch program, population density, population growth, and the age of the housing stock.

[3]See also Haughwout (1997), who suggests the presence of a public sewer hookup as a dummy for older, inner-ring suburbs.

All of these approaches have merit, but none incorporate the experience of officials in suburban communities. Our preferred definition of mature suburbs is based on the literature we have cited as well as an analysis of interviews with political leaders, administrators, and scholars focused on older suburban areas. According to Anacker (2006), the issues identified by these experts led her to define a mature suburb as one with at least two of the following three characteristics:

1. Sharing a boundary with the adjacent central city
2. Not sharing a boundary with an adjacent unincorporated area (called a township in Ohio)
3. Placement in the lower half of all municipalities in each county ranked by proportion of vacant residential parcels—in other words, little land available for development[4]

If a suburb does not have at least two of the three characteristics, it is defined as a developing suburb. Looking at only vacant residential parcels is somewhat limiting, but most mature suburbs have relatively little land categorized for any use other than residential.

This definition incorporates past research as well as the views of those who live in and administer mature suburbs. Its focus is on location and the age of the stock/infrastructure (both measured by adjacency to the central city) and lack of opportunity to expand revenues (inability to annex and absence of vacant land to develop). These two issues form the crux of the problem for mature suburbs. Anacker (2006) found that the definition worked reasonably well in underbounded cities such as Cleveland as well as in overbounded cities such as Columbus (OH).

Data and methods

Our data represent home sales in the central county of Cleveland, the largest metropolitan area in Ohio.[5] According to the 2000 census, Cuyahoga County has a population of 1,393,978 (U.S. Bureau of the Census 2000). Cleveland, like many (though certainly not all) U.S. cities, is entirely surrounded by its suburbs. The mature suburbs of Cuyahoga County range from very troubled (e.g., East Cleveland) to quite well-off and apparently

[4]We did not use the potential variable Age of the Suburb as a characteristic of a mature suburb because many suburbs grow by leaps and bounds. Thus, using median age might not be the best measure to determine whether a suburb is mature or developing.

[5]We would have liked to analyze the entire Cleveland metropolitan area but faced constraints with regard to data acquisition.

healthy (e.g., Bay Village) (Margulis 2002). Some mature suburbs have initiated one of the first councils of government devoted to issues of mature suburbs and are thus at the forefront of a trend that many mature suburbs have just begun to notice.

The two main goals of this article are to examine the property values of single-family homes in mature suburbs and to test the specific factors that influence their behavior. The primary data source is the PaceNet database of sales transactions purchased from First American Real Estate Solutions (2003). This database contains all property transactions in Cuyahoga County between 1985 and 2000. Only single-family residential land use transactions were used in this analysis. Single-family homes are the basis for the suburbs, and so they are the primary concern of this research.

The database contains the most recent sale of a property between 1985 and 2000. In other words, it does not contain all properties or all sales in Cuyahoga County during that period. This invites the possibility of nonrandomness, as Haurin and Hendershott (1991) point out. Some price classes of properties might be disproportionately represented in the database.[6] Further, properties in appreciating neighborhoods might sell more frequently because home sellers might use the profits to make a down payment on the next property on their way up the housing ladder. Those selling in declining neighborhoods might be overrepresented as people flee.

The database has information on the exact address and physical characteristics of each unit. Some variables are nominal (e.g., building style) and were treated as dummies. Dummy variables for the sale season (winter, spring, summer, fall) were also created as controls. Most transactions occurred during the summer, so the category "summer transactions" is the omitted variable for these dummies (Hamilton 1992). Lot and housing characteristics, such as rolling topography, lot size, square footage, number of full bathrooms, and age of the housing unit, were included in the analysis.[7]

[6]About 5 percent of a community's homes sell in one year (Thomas Bier, telephone conversation on April 29, 2006), but there is no way to test the bias potentially introduced by differential sales rates.

[7] We paid special attention to the Age of the Housing Unit variable. We undertook curve-fitting exercises based on the assumption that the age of the unit and the property value are related in a nonlinear fashion (Goodman and Thibodeau 1997, 1998). Tests with classified dummy variables (Age of Housing Unit 0 to 10 Years, Age of Housing Unit 11 to 20 Years, etc.) showed that in most cases the coefficients describing their relationship with property value (sale price) change from positive (for newer housing units) to negative (for older housing units). Therefore, we squared the (unclassified) variable Age of the Housing Unit (Cannaday and Sunderman 1986; Clark and Herrin 2000; Grether and Mieszkowski 1974; Malpezzi, Ozanne, and Thibodeau 1987).

In addition to the information provided in the PaceNet database (First American Real Estate Solutions 2003), four housing and neighborhood factors and two socioeconomic factors related to suburban change were added to our database (Andersson 2000).[8] With respect to housing and neighborhood factors, we chose accessibility, tax rate, public safety, public school quality, and selected housing characteristics for the analysis. We used two accessibility variables: the distance from the geographic centroid of each property's census tract to downtown (to account for the remaining importance of the central business district as a place of employment, retail, and other amenities—see Anas 1981; Gin and Sonstelie 1992; Muth 1969; and Voith 1991) and the distance from the geographic centroid of each property's census tract to the nearest interstate or state route access point (to account for accessibility to all parts of the metropolitan area—see Bruinsma, Rienstra, and Rietveld 1997 and Kockelman 1997a, 1997b). Both variables were created based on 2000 data.

Assuming that amenities and disamenities are capitalized into property values (Mieszkowski and Zodrow 1989; Oates 1969, 1973, among others), we used the effective property tax rate, an unbiased measure, for each tax district for the particular year the property was sold (Chinloy 1978; see also Ihlanfeldt and Jackson 1982 for an alternative opinion and Case 1978 for an excellent summary). Information on the effective tax rate was provided to the first author (Katrin B. Anacker) by the Cuyahoga County Treasurer's Office. Following Clark and Cosgrove's (1990) suggestion that measures of urban crime are important determinants of property values, the murder rate (per 100,000 population) was included at the municipal level. We created an average of the murder rates for 1992, 1997, 1998, 1999, and 2000.[9]

[8]Ideally, we would have liked to include variables that have a consistent level of observation. To our knowledge, these variables do not exist. This invites the problem of using hierarchical or nested data. In the hedonic context, variables at a higher level (school district, neighborhood subdivision, etc.) influence variables at a lower level (individual housing unit), but conventional regression analyses do not adjust correctly for such cross-level phenomena. Conventional models assume that random errors are independent and normally distributed and have constant variances. However, when it comes to nested data, observations within groups are dependent. The constant variance assumption is violated because the group-level random error is also assumed to vary across groups. Moreover, standard errors associated with the tests of the group-level variables could be underestimated (Raudenbush and Bryk 2002). Future research will focus on a hierarchical linear model.

[9]The U.S. Department of Housing and Urban Development's *State of the Cities Data System* (2003) contains data for 1992, 1997, 1998, 1999, and 2000 only. For consistency with other data sets, we used only the 2000 data for the analysis. Murder rates were chosen as the most visible and frightening crimes as well as the those most widely covered by the media, so their occurrence in specific communities would be well known.

School quality is important to property values as well (Brasington 2000). Thus, we included the pass rate for the sixth-grade mathematics test in each school district in 2000.[10] This test is considered to be particularly difficult because of its content and form.[11]

The proportion of non-Hispanic white heads of household and average household income were chosen as socioeconomic measures. These were obtained from the 1980, 1990, and 2000 U.S. censuses at the census tract level after adjusting for boundary changes over time (U.S. Bureau of the Census 1980, 1990, 2000). On the basis of information provided by the censuses, yearly rates and values were calculated by building weighted averages. An example will clarify how these weighted averages were calculated: for rates (values) for 1981, the 1980 rates were weighted by 0.9 and the 1990 rates were weighted by 0.1, and the two were then averaged.

The extensive discussion of racial composition and its impact on house prices in the literature suggests that this variable is likely to influence property values. However, it is not clear what race means in these analyses. It might, for example, indicate perceptions about blacks living in the same neighborhood or socioeconomic phenomena not caught by other direct variables such as income. Nevertheless, the variable proportion of non-Hispanic whites in the census tract was used for the quantitative analysis.

We used average household income as a proxy for demand as well as an indicator of preferences for neighborhoods characterized by high household incomes and low crime rates. The higher the average household income in a neighborhood, the greater the demand for property and the higher the property values.[12]

These variables were incorporated into a hedonic model with transaction price as the dependent variable. The hedonic approach treats the house as a bundle of characteristics sold for a single price (Epple 1987; King 1976; Lancaster 1966; Rosen 1974; Witte, Sumka, and Erekson 1979).

[10]The Ohio Department of Education, when contacted by one of the authors, was unable to provide data before 2000.

[11]It is a short answer test, not the typical multiple-choice test, so the results depend less on chance and more on learned knowledge.

[12]More specifically, we used Average Household Income per Census Tract, although the median would be preferred over the average because the latter is prone to be influenced by outliers. Because of the longitudinal nature of this study and the fact that census tract boundaries change over time, as discussed later, Average Household Income per Census Tract had to be used.

In sum, the following variables were selected for the quantitative analysis. The dependent variable is the sale amount in dollars (natural log). This amount serves as a proxy for the value of the house. The functional form chosen for the model was the semi-log, which is often used when the dependent variable has a wide spread and several independent variables have a concave function (Cannaday and Sunderman 1986). The semi-log specification helps normalize the distribution of the error term, a desirable characteristic for ordinary least squares (OLS) estimators (Kennedy 2003). Information on the independent variables used in our regressions is provided in table 1.

We performed tests for multicollinearity (UCLA Academic Technology Services n.d.) and heteroskedasticity (Pindyck and Rubinfeld 1998). Results of the test for multicollinearity show that no pair of variables has a correlation higher than 0.75, the threshold chosen for this analysis.[13] To test for nonconstant variance, we conducted Breusch-Pagan and White's tests. Results show that there is heteroskedasticity.[14] To address this issue, we estimated a weighted OLS model that places less weight on the observations with large error variances than on those with smaller ones.[15] Results will be discussed in the next section.

Many authors argue that housing submarkets can affect the results of hedonic equations predicting house prices (see Bourassa, Hoesli, and Peng 2003 for a good overview; see also Adams 1991 and Goodman and Thibodeau 1997, 1998). We used the Chow test (which we adapted from Gould 2005) to determine whether the groupings used in this study define different

[13]Strong multicollinearity, such as a multicollinearity of 0.75, is common and still permits estimation, although the results will be less precise (Hamilton 1992). We assume that there are multiple factors that influence property values. Thus, multicollinearity is tolerated.

[14]In this case, OLS estimation places more weight on the observations with large error variances rather than on those with smaller ones. The reason for this weighting is that the sum of squared residuals associated with large-variance error terms are likely to be greater than the ones associated with low-variance errors. This implicit weighting causes the OLS parameter estimators to be inefficient (the variances of the estimated parameters are not the minimum variances and are also biased, although the parameters are still consistent) (Pindyck and Rubinfeld 1998).

[15]Since the variance and the weight are not known, we must estimate them. Nielsen (2002) suggests several steps to calculate weights. First, estimate an OLS regression of the dependent variable on the independent variables to obtain the residuals; second, estimate a standard deviation function based on visual evidence gained from a residual plot by regressing the residuals on the dependent variable; and third, calculate the weights by inversing a fitted value (estimate) of the variance based on a regression with the variance as dependent variable. This procedure yields efficient parameter estimators that satisfy all of the assumptions of the classical linear regression model.

Table 1. List of Variables Used in the Study, Expected Signs, Hypotheses, and References

Variable	Expected Sign	Hypothesis	Reference
Dummy Sale Season	Neutral for spring, summer, and fall Negative for winter	Lower demand for homes during the winter	Goodman and Thibodeau 1997, 1998), among others
Dummy Sale Year	Positive	Homes appreciate nominally over time	Bogart and Cromwell (1997, 2000), among others
Distance from the Geographic Centroid of the Census Tract to Downtown (miles)	Unclear	Negative coefficient: *land prices* decrease outward from the center to compensate for the cost of commuting Caveats: major job centers located around the outer belt; all other things being equal, no evidence that *structure* prices necessarily decline with distance from the central business district, only *land* prices	Kim and Morrow-Jones (2005), Muth (1969) and Rachlis and Yezer (1985)
Distance from the Geographic Centroid of the Census Tract to the Nearest Interstate or State Route Access Point (miles)	Unclear	Negative coefficient: commuting costs and land prices interact Positive coefficient: in the long run, fuel prices have decreased and the efficiency of many cars has increased	Bruinsma, Rienstra, and Rietveld (1997) and Muth (1969)
Effective Property Tax Rate in the Tax District at Year of Sale	Negative	Holding everything constant, the higher the effective property tax rate in a tax district, the lower the sales amount	Mieszkowski and Zodrow (1989)
Average Crime Rate in the Municipality (per capita murder rate in 1992, 1997, 1998, 1999, and 2000)[1]	Negative	Everything else being equal, the higher the per capita murder rate, the lower the sales amount	Clark and Cosgrove (1990)
Pass Rate on the State Sixth-Grade Mathematics Test in the School District in 2000[1, 2]	Positive	All other things being equal, the higher the pass rate on the test, the higher the sales amount	Jud and Watts (1981)
Proportion of Non-Hispanic White Heads of Household in the Census Tract at Year of Sale	Neutral or positive	All other things being equal, the higher the proportion of non-Hispanic whites in a census tract, the higher the sales amount[3]	Hoyt (1939)

Table 1. List of Variables Used in the Study, Expected Signs, Hypotheses, and References *continued*

Variable	Expected Sign	Hypothesis	Reference
Average Nominal Household Income in the Census Tract at Year of Sale[4]	Positive	All other things being equal, the higher the median household income in a census tract, the higher the sales amounts[5]	Kushner and Fortura (1986)
Dummy Rolling Topography	Positive	Homeowners prefer a rolling topography that adds to the aesthetics of the setting	Appraisal Institute (2001)
Lot Size (square feet)[4]	Positive	If everything is held constant, the larger the lot size, the higher the sales amount	Appraisal Institute (2001), Mills (1972)
Square Footage of the Unit at Year of Sale[4]	Positive	All other things being equal, the higher the square footage of the unit, the higher the sales amount	Mills (1972)
Number of Full Bathrooms in the Unit at Year of Sale	Positive	All other things being equal, the higher the number of full bathrooms, the higher the sales amount	Mills (1972)
Age of the Unit in Years at Year of Sale (Squared)	Ambiguous	Negative coefficient: for younger housing units because of the need for maintenance or investment Positive coefficient: for older housing units because the vintage effect outweighs the need for maintenance or investment	Goodman and Thibodeau (1997), Haughwout (1997)

[1] Because longitudinal data could not be located, endogeneity is suspected.
[2] Ohio Department of Education (2003).
[3] Variable Average Change in the Proportion of Non-HispanicWhite Heads of Household in the Census Tract First Five Years after Year of Sale was created and integrated into the model. This variable did not cause any problems in most models, but it did cause the model to become full rank in the case of Cincinnati. Thus, this variable was not integrated into the model.
[4] Variable divided by 1,000 for the sake of simplicity and convenience of interpretation of the regression results.
[5] Variable Average Change in the Average Nominal Household Income in the Census Tract First Five Years after Year of Sale was created and integrated into the model. Unfortunately, including this variable caused the model to become full rank. Thus, this variable was not integrated into the model.

submarkets. Results show that the three submarkets selected for analysis are a reasonable grouping. Thus, we estimated three weighted regression models, one for each of the following:

1. Cuyahoga County's central city—Cleveland
2. Cuyahoga County's mature suburbs
3. Cuyahoga County's developing suburbs

These submarkets are the basis of the discussion of the results in the following section.[16]

Results

Spatial pattern and descriptive statistics

Cuyahoga County's submarkets—central city (census tracts listed as comprising the city of Cleveland in U.S. Bureau of the Census databases), mature suburbs (Anacker 2006 definition), and developing suburbs (everything else)—are shown in figure 1. Cuyahoga County's mature suburbs have a concentric ring structure (interrupted by Lake Erie).

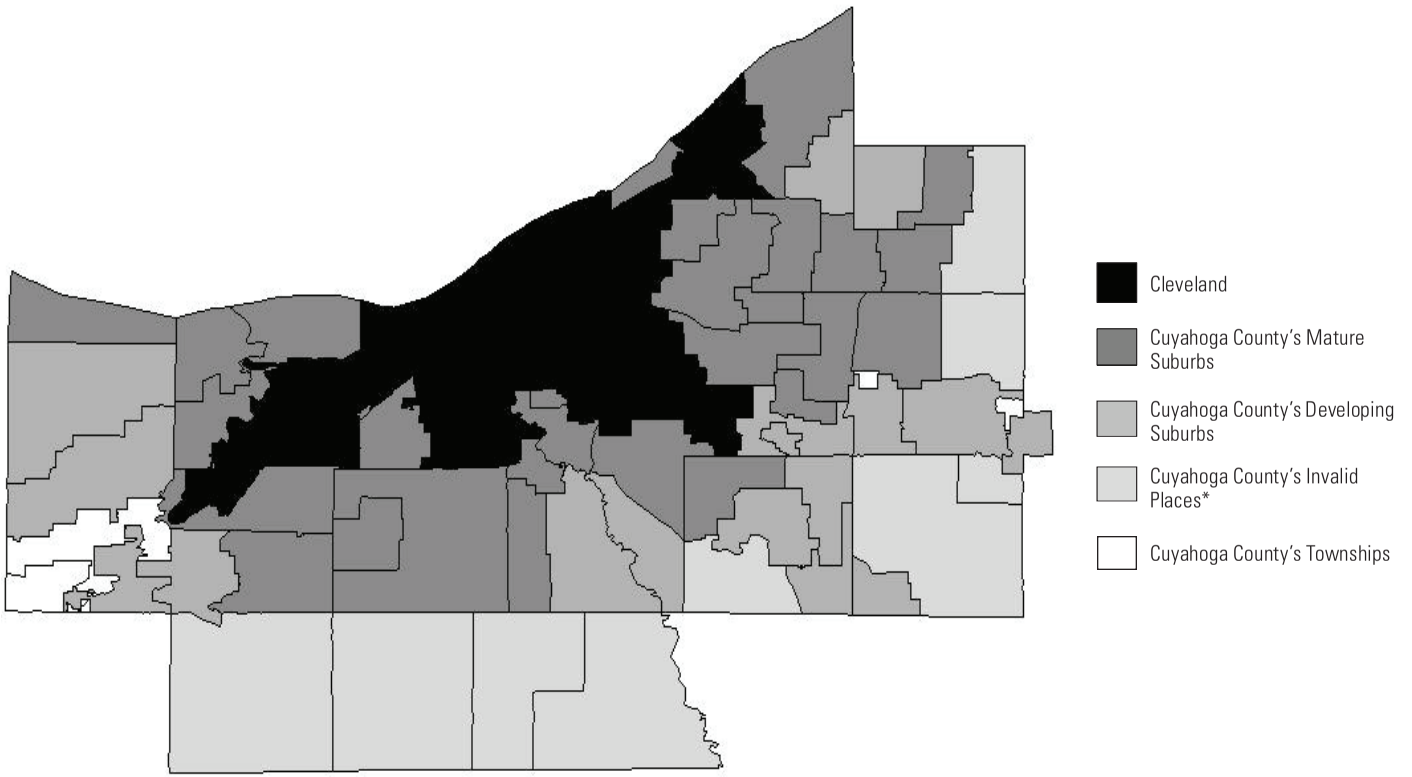
Although the three submarkets are in Cuyahoga County, their housing markets and residents have different characteristics (see table 2; all variables are significantly different between any pair of locations).

Not surprisingly, most of the characteristics of the housing units in mature suburbs fall between those of the central city and those of the developing suburbs. This is true for sale price, distance to downtown, proportion of non-Hispanic whites, average income, and house size (square footage). In both murder rates and test results, the mature suburbs are much more like the developing suburbs than the central city.

The average age of the housing units is interesting in that the housing in the mature suburbs is about 45 years old and falls between the ages of the other two submarkets. Thomas Bier noted in a telephone conversation on April 29, 2006, that communities can start to become less attractive when they are between 40 and 60 years old. The main problem is that this is the time frame when a roof needs to be replaced for the second time. The first replacement can simply be put on over the original roof. For a second replacement, however, the first two layers must be removed, and the process is much more expensive. At this point, a homeowner might start to wonder

[16]Spatial autocorrelation will be addressed in future research. See Can (1990) and Can and Megbolugbe (1997).

Figure 1. Mature Suburbs in Cuyahoga County (30 out of 55 Suburban Municipalities)



*Invalid places spill over to the adjacent county.

Table 2. Descriptive Statistics for Cleveland and Cuyahoga County's Mature and Developing Suburbs for Selected Variables

Variable	Cleveland*	Mature Suburbs (Grouped)*	Developing Suburbs (Grouped)*
Sale Price at Year of Sale	$54,8331 < 0.000	$113,011 < 0.0001	$152,605 < 0.0001
Distance to Downtown (miles) (in 2000)	5.48 < 0.0001	8.85 < 0.0001	12.96 < 0.0001
Distance to the Nearest Interstate or State Route Access Point (miles) (in 2000)	0.80 < 0.0001	1.52 < 0.0001	1.44 < 0.0001
Property Tax Rate at Year of Sale	58.52% < 0.0001	60.87% < 0.0001	53.19% < 0.0001
Number of Murders per 100,000 Population in the Municipality (average for 1992, 1997, 1998, 1999, and 2000)	18.58 < 0.0001	2.81 < 0.0001	1.55 < 0.0001
Pass Rate for the Sixth-Grade Mathematics Test in the School District (in 2000)	24.43% < 0.0001	62.59% < 0.0001	78.00% < 0.0001
Proportion of Non-Hispanic Whites in the Census Tract at Year of Sale	61.96% < 0.0001	85.99% < 0.0001	90.05% < 0.0001
Average Household Income in the Census Tract at Year of Sale	$31,704 < 0.000	$51,662 < 0.0001	$63,419 < 0.0001
Lot Size at Year of Sale (in square feet)	5,463 < 0.0001	11,444 < 0.0001	30,073 < 0.0001
Square Footage of the Housing Unit at Year of Sale	1,274 < 0.0001	1,605 < 0.0001	2,028 < 0.0001
Number of Bathrooms in the Unit at Year of Sale	1.0806 < 0.0001	1.2838 < 0.0001	1.6101 < 0.0001
Age of the Housing Unit at Year of Sale (years)	66.24 < 0.0001	45.86 < 0.0001	26.96 < 0.0001
Number of observations	40,046	81,260	40,074

*Values are variable means, followed by independent group *t*-test values in parentheses.

about the value of investing in this older house versus purchasing a newer one—probably in a developing suburb. The second roof is expensive in itself and is a marker of increasing maintenance in an older home.

The lot size characteristics are also interesting. The lot sizes in mature suburbs are more than twice as large on average as the lot sizes in the central city, but less than 40 percent of the size of the lots in the developing suburbs. When a household considers remodeling and adding on to a home, the size of the lot becomes important. A common addition in the mature suburbs would be an extra bathroom, given that the average is only 1.28 baths, compared with 1.61 baths in developing suburbs.

In two characteristics, mature suburbs had the highest values: distance to the nearest interstate or state route access point and property tax rates. The former may indicate that Cleveland's mature suburbs are located inconveniently in terms of the road network. This may be a deterrent when homeowners are considering their commutes to work. The property tax rate is a clear negative for most homeowners. The rates indicate that Cleveland's mature suburbs are taxing themselves relatively heavily, and this relates to Orfield's (2002) issue of revenue-generating capacity in these older communities.

House price behavior/appreciation

We are interested in how the property values of single-family homes have behaved in mature suburbs compared with central cities and developing suburbs. Our results show that between 1985 and 1999, Cuyahoga County had an average nominal appreciation rate of 4.83 percent. Cleveland had an average rate of 1.65 percent, versus 3.89 percent for its mature suburbs and 4.28 percent for its developing suburbs. We also see significant volatility over time, especially for sales in the city of Cleveland, with peaks in 1993 (18.96 percent) and 1995 (14.08 percent) and a trough in 1994 (–16.69 percent). There seems to have been more volatility in the late 1980s and early 1990s than in the mid- to late 1990s.[17] Figure 2 illustrates this volatility.

With respect to the nominal average appreciation rate[18] from 1986 to 2000, the rate for mature suburbs in Cuyahoga County is, as expected, higher than it is for Cleveland but lower than it is for the developing suburbs.

[17]Creating moving averages helps smooth out results. Results are available from the authors on request.

[18]We calculated the nominal appreciation rate based on a regression with all independent variables, also called the controlled case. An alternative approach could have been to calculate the nominal appreciation rate based on a regression with dummy sale years only as independent variables, also called the uncontrolled case. Results for the uncontrolled case are available from the authors on request.

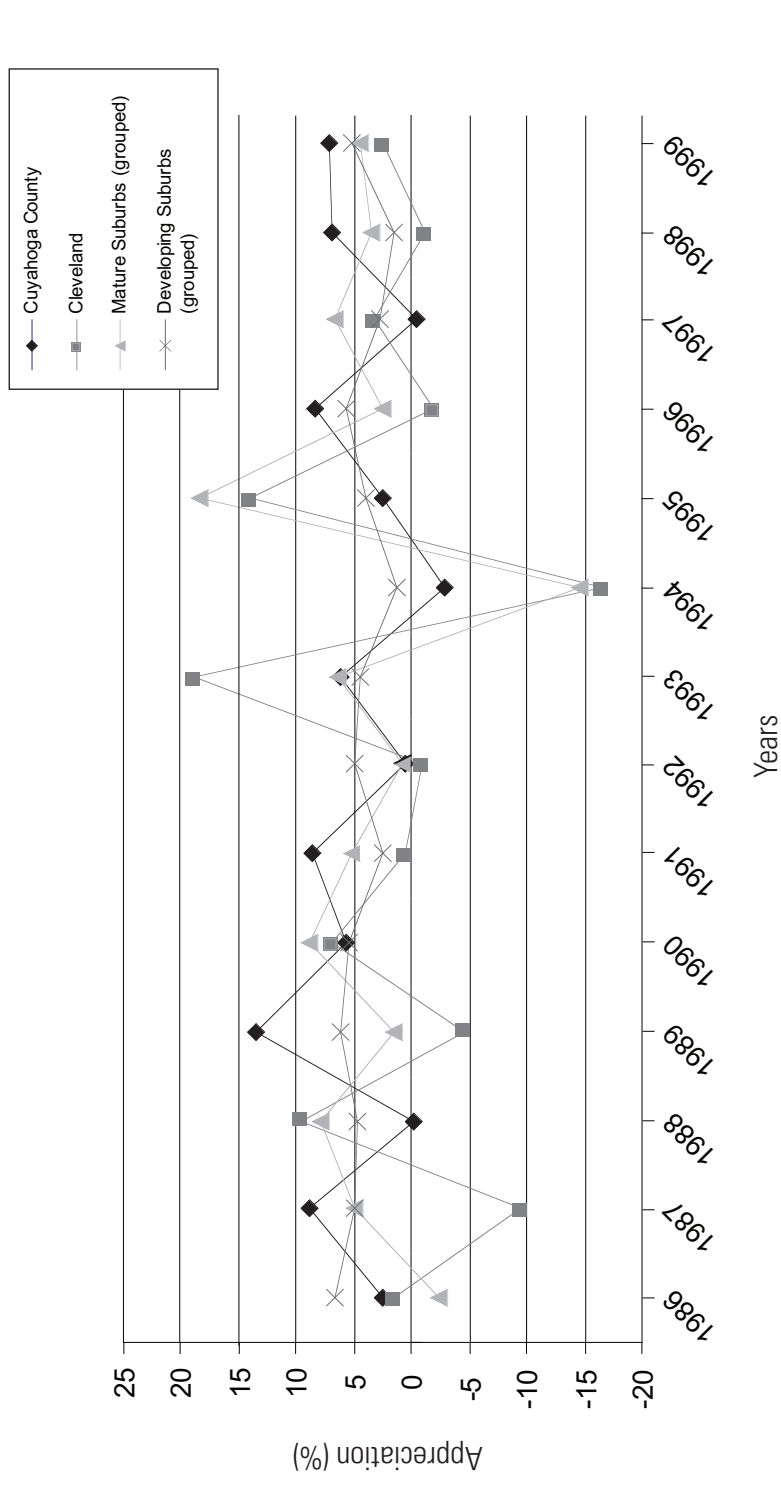


Figure 2. Sale Price Appreciation, 1986 to 1999: Cleveland and Cuyahoga County's Mature and Developing Suburbs

In addition to calculating the nominal average appreciation rate, we calculated the ratio of a particular submarket to the entire county. Figure 3 shows that the ratio for mature suburbs has remained stable between 1985 and 2000, while the ratio for Cleveland increased in the early 1990s. This could be an indicator of slightly improved prosperity in Cleveland (see also Mikelbank et al. n.d.). The ratio for developing suburbs was more volatile.

There is no overall decline in property values in these mature suburbs, although the average growth in prices is lower than it is in the developing suburbs.

Regression model

We asked what specific factors influence the property values of single-family homes in mature suburbs compared with central cities and developing suburbs. A weighted least squares regression model was estimated for all three submarkets, and the results are shown in table 3.

In most of the regressions, our model explains about 60 percent of the total variation in sale price (see table 3). The significant variables have generally consistent signs, although there are exceptions. The following discussion will focus on select variables, ignoring control variables (such as season and year) and focusing on the substantive variables of interest.

Traditional models suggest a negative coefficient for the distance to downtown, although the multimodal structure of most urban areas may make this less important relative to our second access variable, distance to a major highway. Cleveland had unexpected positive coefficients. This finding might indicate employment opportunities and amenities in areas other than downtown, as supported by the polycentric literature referred to earlier. It may also indicate that home buyers in the central city prefer to be some distance from workplaces (perhaps because there are many workplaces nearby in the central city), while home buyers in the mature and developing suburbs found it a detriment to be farther from downtown.

Since employment centers are not all focused on downtown, we added the variable distance from the geographic centroid of the census tract to the nearest interstate or state route access point to measure overall access. This variable was positive in all submarkets. Thus, being close to a highway decreases prices.[19] This variable might measure being close to commercial facilities and heavy traffic, which are considered less attractive.

[19]We are grateful to one of the anonymous reviewers who pointed out that this might be a nonlinear relationship and that there might be a threshold. Future research will focus on this interesting phenomenon.

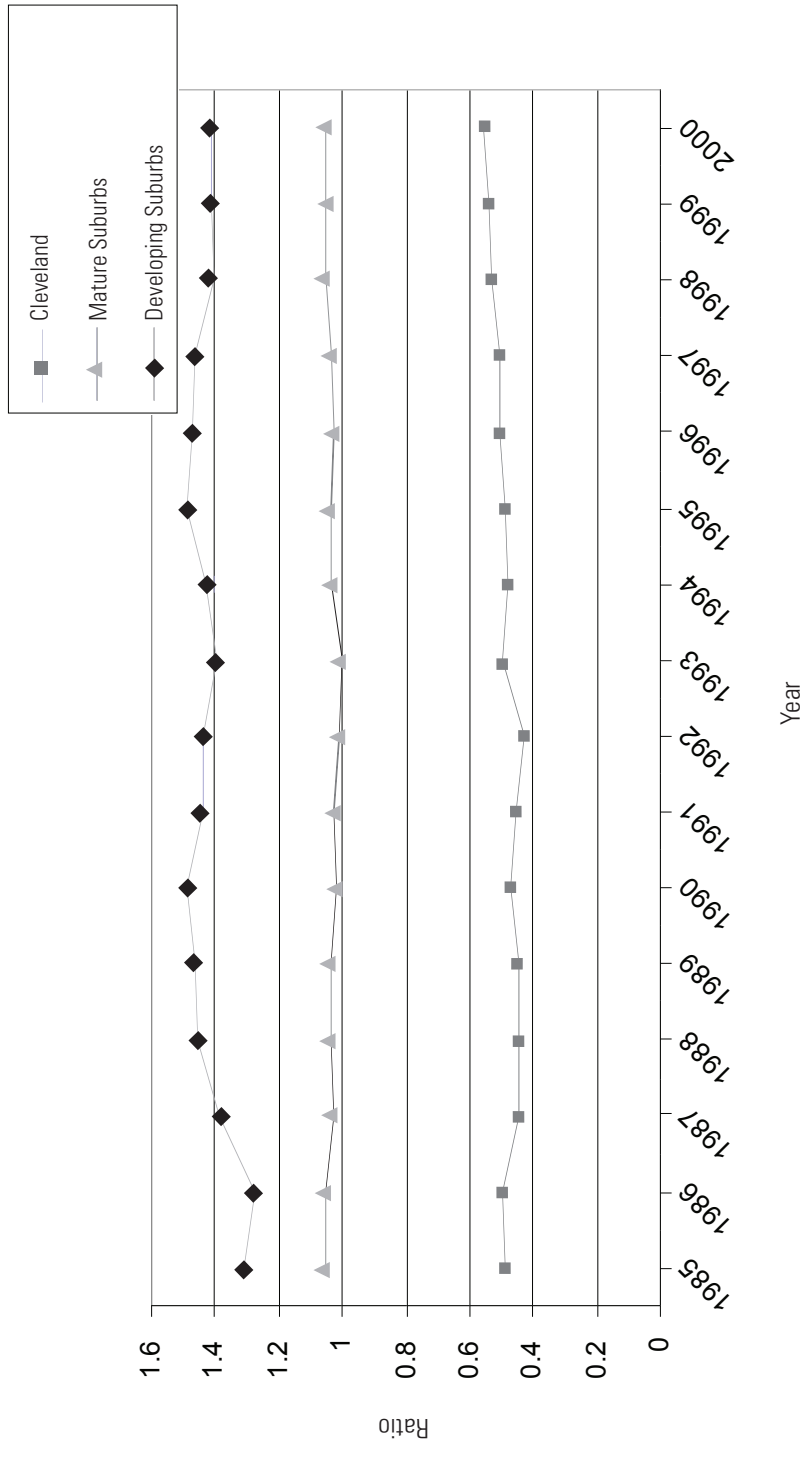


Figure 3. Ratio of the Sale Price in the Submarket to the Sale Price in Cuyahoga County

Table 3. Log-Linear Weighted Least Squares Regression: Cleveland and Cuyahoga County's Mature and Developing Suburbs

Coefficient [level of observation]	Cleveland[a]	Mature Suburbs (Grouped)[a]	Developing Suburbs (Grouped)[a]
Intercept	9.31410 (165.46)	10.79279 (943.96)	10.59274 (393.02)
Winter Season (dummy) [housing unit]	–0.11028 (–18.65)	–0.02903 (–8.51)	–0.0548 (–9.27)
Spring Season (dummy) [housing unit]	0.01325 (2.97)	NS	–0.04865 (–11.59)
Fall Season (dummy) [housing unit]	–0.02321 (–4.46)	NS	–0.00947 (–1.96)
Sale Year 1985 (dummy) [housing unit]	–0.35212 (–25.49)	–0.68536 (–93.87)	–0.56529 (–42.50)
Sale Year 1986 (dummy) [housing unit]	–0.33583 (–25.81)	–0.62365 (–88.51)	–0.50032 (–43.60)
Sale Year 1987 (dummy) [housing unit]	–0.43031 (–33.89)	–0.58261 (–86.45)	–0.45264 (–34.02)
Sale Year 1988 (dummy) [housing unit]	–0.33355 (–24.22)	–0.52905 (–78.58)	–0.40239 (–27.64)
Sale Year 1989 (dummy) [housing unit]	–0.37860 (–29.79)	–0.49053 (–73.28)	–0.34592 (–25.80)
Sale Year 1990 (dummy) [housing unit]	–0.30952 (–24.91)	–0.41311 (–63.39)	–0.28913 (–23.87)
Sale Year 1991 (dummy) [housing unit]	–0.30389 (–30.60)	–0.33971 (–53.47)	–0.25643 (–22.39)
Sale Year 1992 (dummy) [housing unit]	–0.31291 (–20.44)	–0.33871 (–63.15)	–0.21294 (–18.57)
Sale Year 1993 (dummy) [housing unit]	–0.12332 (–11.04)	–0.28206 (–68.02)	–0.16859 (–14.61)
Sale Year 1994 (dummy) [housing unit]	–0.29022 (–25.51)	–0.25482 (–46.47)	–0.15165 (–12.87)
Sale Year 1995 (dummy) [housing unit]	–0.14947 (–11.37)	–0.21070 (–41.18)	–0.11425 (–9.55)
Sale Year 1996 (dummy) [housing unit]	–0.16766 (–13.70)	–0.15040 (–29.61)	–0.01987 (–3.09)
Sale Year 1997 (dummy) [housing unit]	–0.13460 (–16.69)	–0.11928 (–26.34)	–0.05065 (–6.35)
Sale Year 1998 (dummy) [housing unit]	–0.14605 (–16.52)	–0.10139 (–16.51)	NS
Sale Year 1999 (dummy) [housing unit]	–0.12147 (–14.44)	–0.04753 (–9.82)	0.01653 (2.34)
Distance to Downtown (miles) (in 2000) [geographic centroid of the housing unit's census tract]	0.01923 (14.85)	–0.00603 (–10.70)	–0.00679 (–5.90)

Table 3. Log-Linear Weighted Least Squares Regression: Cleveland and Cuyahoga County's Mature and Developing Suburbs *continued*

Coefficient [level of observation]	Cleveland[a]	Mature Suburbs (Grouped)[a]	Developing Suburbs (Grouped)[a]
Distance to the Nearest Interstate or State Route Access Point (miles) (in 2000) [geographic centroid of the housing unit's census tract]	0.04417 (7.30)	0.01900 (14.73)	0.01927 (8.15)
Property Tax Rate at Year of Sale [property tax district]	–0.00449 (–5.42)	–0.00280 (–25.76)	NS
Number of Murders per 100,000 population (average of 1992, 1997, 1998, 1999, and 2000) [municipality]	NA	–0.03572 (–51.47)	0.00948 (7.17)
Pass Rate for the Sixth-Grade Mathematics Test (in 2000) [school district]	0.00913 (23.16)	0.00289 (44.97)	0.00304 (16.66)
Proportion of Non-Hispanic Whites at Year of Sale [census tract]	0.00410 (38.84)	0.00265 (34.03)	0.00179 (12.89)
Average Household Income at Year of Sale [census tract]	0.03013 (83.33)	0.00338 (49.92)	0.00304 (32.06)
Rolling Topography (dummy) [housing unit]	NS	NS	NS
Lot Size at Year of Sale [housing unit]	NS	0.00024128 (2.47)	0.00005160 (3.98)
Square Footage at Year of Sale (1,000 square feet) [housing unit])	0.43752 (60.50)	0.40978 (133.48)	0.37182 (94.94)
Number of Bathrooms at Year of Sale [housing unit]	NS	0.04942 (13.69)	0.05062 (11.90)
Age at Year of Sale [housing unit]	–0.00005311 (–49.46)	–0.00003128 (–37.63)	–0.00002857 (–19.19)
Adjusted R^2	0.6106	0.6070	0.5644
F value	1,935.45	3,909.57	1,589.14
Pr > *F*	< 0.0001	< 0.0001	< 0.0001

Notes: Cleveland: N = 40,046; Mature Suburbs: N = 81,253; Developing Suburbs: N = 40,067.
[a]t-values are in parentheses.
NA = variable not included in the analysis because of perfect collinearity; NS = variables with *Pr* > |*t*| 0.05 omitted.

The variable crime rate in the municipality (average of 1992, 1997, 1998, 1999, and 2000) was expected to have a negative coefficient, although it was positive in the developing suburbs. This might be attributed to the fact that murders are relatively unusual. Perhaps property crimes would be a better choice.

As expected, the variable pass rate on the state sixth-grade mathematics test had a positive coefficient in all cases. Our expectations and the empirical results are both consistent with the expectations discussed earlier.

Property taxes play a different role in the central city and mature suburbs than in the developing suburbs (see tables 2 and 3). The variable is significant in Cleveland and in the mature suburbs, but here higher property taxes drive house prices down. The mature suburbs might be tempted to try to raise property taxes to make up for their relative lack of resources, but our results indicate that the effect on the market value of the homes in those suburbs would not be positive. In addition, table 2 indicates that the mature suburbs already have relatively high property tax rates, so raising them could drive out homeowners.

Factors that relate to space, such as square footage and the number of bathrooms, were important in all three places, but somewhat more important in mature suburbs and the central city than in the developing suburbs (see tables 2 and 3). Adding 100 square feet to a home results in an increase in property value of around 4.1 percent in the mature suburbs. Adding the same amount of space in Cleveland results in an increase in property value of around 4.4 percent. The increase is lower in the developing suburbs at 3.7 percent, probably because homes are already bigger there. On average, single-family homes in the mature suburbs are 331 square feet larger than in Cleveland, resulting in a price differential of 13.27 percent. Similarly, on average, single-family homes in the developing suburbs are 423 square feet larger than in the mature suburbs, resulting in a price differential of 15.23 percent.[20]

Adding a bathroom results in an increase in property value of about 5 percent in the mature suburbs. In developing suburbs, it would add about 5.1 percent. In other words, the amount of housing space matters, and catering to modern tastes (indicated here by the number of bathrooms) matters. These findings are consistent with the First Suburbs Consortium Housing Initiative study (2002), which found that housing space is the most important issue for homeowners in mature suburbs.

[20]We are grateful to one of the anonymous reviewers who pointed this out.

The age of the housing unit is significant and negative in all of the models, but it is clear that some housing cohorts have smaller units than others (e.g., homes built in the 1950s versus those built in the 1900s) and that this will have particularly important effects in places where those smaller houses are concentrated—mainly mature suburbs (see tables 2 and 3).

Discussion and conclusions

Past research on property values produced a variety of models to explain central city decline. More recent work has concentrated on the suburbs, using resident-related socioeconomic variables to suggest and possibly explain suburban decline (Lucy and Phillips 2000, 2006; Orfield 2002; Puentes and Warren 2006). Our conclusion is that the nominal appreciation rate does not support the idea of overall price decline in mature suburbs. Instead, we see slow growth in house prices in mature suburbs during the study period (1985 to 2000).

The primary objective of this research was to analyze appreciation rates and the impact that selected variables have on property values in older suburbs. The appreciation rates for mature suburbs lie between the rates for the central city and those of the developing suburbs. The results of the regressions show that the coefficient of the Age of Unit at Year of Sale variable is negative in all three subgroups, indicating that house prices fall with age in all areas (possibly due to an increase in the need for maintenance investments). We found no positive vintage effect in general in our study communities.

Three key factors differentiate our house price model for mature suburbs from the one for developing suburbs. The first is location: Being farther from downtown and from major highways is better in mature suburbs, while being farther from downtown lowers property values in developing suburbs. The second is property taxes. Lower property taxes improve prices in mature suburbs but do not have this effect in developing suburbs. Finally, the size of the typical house in the suburbs plays an important role in value. These variables are key in determining which mature suburbs will have more (or fewer) challenges than others (see First Suburbs Consortium Housing Initiative 2002).

Our analyses indicate that mature suburbs have some commonalities with the central city and some with developing suburbs. However, they have special challenges as well, as shown in table 2. Although there is no general decline in property values in the case study communities at the moment, their future looks tenuous. Mature suburbs in our study communities have the following issues: age of the housing units, high property taxes, smaller home

size and fewer amenities, lots that do not permit a great deal of expansion, and somewhat poor access to job locations. These are all problems that the mature suburbs will have to face as they struggle to redefine their role in the evolving metropolitan geography.

Our study analyzed property values in the mature suburbs in Ohio. The case study approach limits the generalizations we can derive from the results. Future research could test the suggested definition in this study in other communities in the Rustbelt and/or the Midwest to see whether results are similar or whether the definition needs to be improved. Increasing the number of study communities might help create a suburban typology (see Mikelbank 2004). One potential follow-up study could test the model with a repeat sales index to see whether it is robust. Using more recent data might also address the volatility issues we encountered in our study.

Another potentially fruitful follow-up study might address the variety in the housing stock in terms of age, splitting the data set into neighborhoods built before 1940, during the 1950s, during the 1960s, and after the 1970s to see whether they have appreciated differently and which specific factors contribute to property values.

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