ProfitWise
news and views

Determinants of housing values and variations in home prices across neighborhoods in Cook County

by Maude Toussaint-Comeau and Jin Man Lee

Introduction

From 2007 to 2009, the U.S. underwent one of the worst recessions in its history, a recession triggered by an unprecedented, international financial crisis that resulted from institutional portfolio concentration in securities backed by home mortgages, and the collapse of that securities market. The period saw a wave of defaults and foreclosures that spared almost no communities in metropolitan areas throughout the country (Bajaj and Story, 2008). Loan defaults and foreclosures, which had tended to be concentrated in lower-income and minority neighborhoods, spread to new and diverse communities, including higher income communities, resulting in broad-based, deep declines in home prices.

The effect of foreclosures and distressed properties remains an issue of much concern to policymakers, community development practitioners, and consumer advocates, and the focus of much research (e.g., Campbell, Giglio, and Pathak, 2011; Baumer, Wolff, and Arnio, 2012; Ergungor and Nelson, 2012; Hartley, 2014; Seo and Mikelbank, 2017). Foreclosures and distressed property sales have enduring repercussions on local housing market values, as well as the pace of market recovery in different local communities. As the overall housing market emerged from the 2008 crisis, many neighborhoods within broader, recovering geographies did not return to market vitality due to (in part) varying geographic concentrations of foreclosures and their disparate effects.

This article reviews the research to date and provides an analysis of local housing market price differentials. We examine the contribution of various factors affecting housing prices, including the structural features of the homes and the characteristics of the neighborhoods in which the properties are located. We also pay particular attention to the effect of distressed property sales on overall home prices in the neighborhoods, post 2007. An important contribution of our exercise is that we are able to derive local housing market price indices. Understanding and measuring house price trends across neighborhoods in various cities has been one of the most challenging, but important topics in housing research recently. Being able to measure house price trends can help housing market stakeholders and policymakers understand which neighborhoods are improving and which continue to struggle, and make strategic decisions about policy development and implementation.

In summary, we find that, well past the height of the 2008 housing financial crisis, in 2017 foreclosures and distressed property sales remained strong contributors of house price depreciation in Cook County. These negative effects are uneven across areas in the county, with places in the city of Chicago (especially low-income areas), seemingly disproportionately affected by housing distress compared to others in suburban Cook County, after controlling for many other characteristics of properties and neighborhoods.

We conduct an examination of the relationship between home value and recovery and income level of the neighborhoods and find that the correlation between income and housing price has increased over time suggesting that the income of the neighborhood has become more important in impacting home values. Home values of neighborhoods in the lower income distribution in the county are still 45 percent or lower than their previous peak. The lack of price recovery in these markets means that homeowners

have little or no equity on their homes and many homeowners remain under water. This bifurcation, given high housing costs and increases in much of the metro area, raises concerns about economic mobility of residents, and continued disinvestment in places with relatively low home values.

The remainder of the paper is organized as follows: the next section provides a review of the literature on housing market price. The third section describes the Cook County housing market considered in this case study, and presents the data which we use to analyze local housing market prices. Section 4 discusses the results of our estimates of the effects of various factors on housing price, and examines the trends in price indices in the different submarkets of Cook County in relation to income levels of the areas. Section 5 concludes with a summary and note regarding the implications of our findings.

Factors affecting housing prices

Measuring housing prices

Housing has features that make it different than other assets from a valuation standpoint. Unlike other assets, few residences are exactly the same, and accordingly, housing involves a unique pricing structure which is determined by not only its own characteristics (e.g., features of the home, its size, number of bedrooms and baths, and overall interior quality), but also by other contextual factors. These include neighborhood characteristics, such as the quality of local schools; and the location in relationship to other centers of interest or value, such as a central business district (CBD) or other centers of employment. In addition, business cycle effects and macroeconomic conditions, such as interest rates, employment and economic growth, and other factors which determine demand and supply of housing, also influence prices.

In practice, various methods are employed to determine house values, the median sales price being one. Median sales price is the midpoint (value) of all sales taking place in a given geography for a given period of time. The primary strengths of this method are: that data on sales activities and prices are often easily available through local deed transfer recordings or multiple listing services; and finding the median is a straightforward calculation. For these reasons, trends in median sales prices are often used by local realtor groups or the media to discuss area house values and trends. The main limitation of this method is that there is no way to control for changes in the underlying composition of properties selling at any two points in time. This constraint has the potential to create "apples to oranges" price comparisons if there are large differences in the mix of the size and quality of properties selling at two points in time, and can be particularly impactful when sample sizes are small, as could be the case in small geographic areas.

Another method, the repeat sales indices, takes the sales activity on a property at two points in time and measures the change in value over that period. The change is weighted based on the length of time between the two sales, and the average change in sales prices for all properties in a sample are calculated and indexed to an earlier point in time, often the first quarter of 2000. The repeat sales index is an improvement over median sales price in many ways. By only tracking price changes for properties that sell multiple times, a repeat sales index is better able to ensure that the price change being measured is for properties with similar characteristics. Repeat sales indices also have limitations, however. Most importantly, because the sample uses only properties that sell at least twice, it is often difficult to get a large enough sample of property sales for a given period to measure price trends in a small geographic area. Case-Shiller is the best known repeat sales index, and it tracks price trends nationally for a group of large metropolitan areas.

The third method (which we will apply for this study) is derived from a hedonic price model, and is estimated using a regression technique. This method combines data on sales price with property and location characteristics, and controls for factors that might affect sales price. A hedonic model reveals how much influence individual factors have on sale prices, and, by isolating the effects of those variables, allows for the development of an index tracking price changes over a period of time on properties with similar characteristics. Hedonic price models are an improvement over repeat sales technique because they include data on far more sales in a given period for a location, as opposed to just those with previous sales, creating a larger sample in smaller geographic areas, while still controlling for characteristics and location of properties being sold in a given period.

Previous research

Kain, Quigley (1970), and Rosen (1974) in their seminal works developed a hedonic model to predict house prices. They included structural characteristics of the housing units, neighborhood characteristics, referred to also as the social and natural environment,[1] and distance to the central business district. Many subsequent researchers have used distance to the city center as their measure of location (Heikkila et al., 1989).[2] The notion of distance to city center in housing market research is drawn from the classical urban economic models, which conceptualize land value, as a negative exponential function of distance (or travel time) from a central business district, assuming a monocentric city (Alonso, 1964; Mills, 1967; Muth, 1969).

Shifts in employment patterns of contemporary urban areas have, however, added complexity to the relationship between housing price, location, and distance. And the hypothesis (in monocentric cities) that prices generally decrease as distance from the CBD increases has tended not to hold (Bender and Hwang, 1985; Coulson, 1991).[3] Researchers have therefore also considered various alternative accessibility measures to predict land values and house prices, including distance from multiple employment centers, not just the CBD (e.g., McMillen and MacDonald, 1990; Day et al., 2007). Other researchers have also considered, in addition to distance, travel time to the CBD and to specific points of interests and other employment centers (Song, 1994; Katz and Rosen, 1987; Des Rosiers et al., 2000).

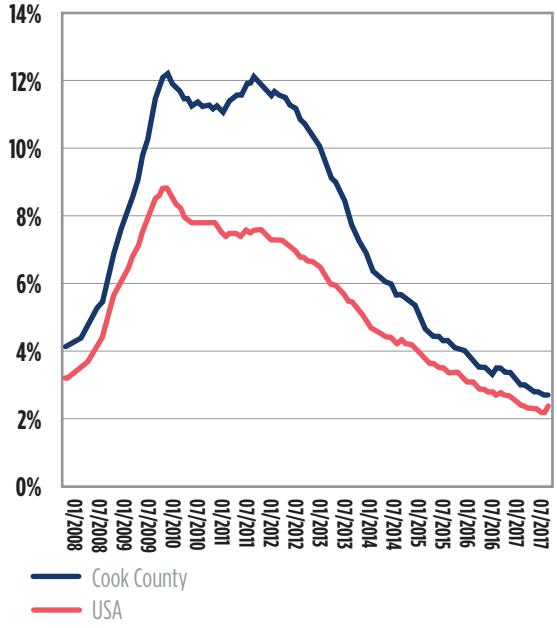
Subsequent to the financial crisis, an emerging line of research has assessed the impact of housing distress or foreclosures on home prices. When a property is foreclosed, it is typically held by a bank as real estate owned (REO) and is left unoccupied for a length of time.[4] Foreclosed properties sell at a discount for many reasons, not least that the sellers are operating under a set of unfavorable incentives that may lead to accepting a lower price, even in areas where housing is appreciating (Pennington-Cross, 2006). This could have a cascading or contagion effect – the idea that foreclosures can also negatively impact property values of both the home being foreclosed upon and nearby properties. Immergluck and Smith (2005) made an estimate of the effect of foreclosures in Chicago from 1997 to 1998, and found that property values in Chicago were lowered by more than $598 million or $159,000 per foreclosure. They (Immergluck and Smith, 2006) also found that higher foreclosure rates contribute to higher levels of violent crime in more vulnerable neighborhoods, making them less attractive to prospective buyers and ultimately contributing to more neighborhood decline and lower property value. Later research findings (e.g., Agarwal et al., 2012; Seo and Mikelbank, 2017; Kaplan and Sommers, 2009) confirmed various additional mechanisms, by which the notion of the contagion effects of foreclosures operate including consideration for submarket geographies, racial segregation, lending practices, and the market participants – whether buyers/sellers are individuals or institutions.[5]

The Cook County housing market and differences in neighborhood income

We focus this analysis on Cook County, the largest and most diverse county in the Chicago MSA, comprising more than 60 percent of the housing units in the MSA. Cook County can be characterized as a "mixed-market" area in the sense that it experienced a more moderate fluctuation in home prices, compared to areas that are well known for having gone through deeper dives in housing prices, such as the Northeast, Florida, and the Southwest in particular, over the recent housing market cycle. The county is particularly well suited for a case study of local neighborhood housing market price differentials post-crash. The area's main amenity is Lake Michigan, which borders it to the east. Aside from that, there are no other significant natural amenities that could explain strong price differentials within the city. Yet, sharp differences exist between housing/land prices between the north and the high minority populated south sides of Chicago, even as both are bordered by the lake, and commuting cost to the central city (the Loop) is roughly similar (Guerrieri, Hartley, and Hurst, 2010). Housing distress, as measured by the amount of loans in serious delinquency and/or foreclosures, has been higher in the county than in the nation (figure 1).

We use PUMAs as our unit of measurement of the local housing market. PUMAs, or Public Use Microdata Areas, are geographic areas defined by the U.S. Census, which represent relatively homogeneous areas. There are 33 PUMAs in Cook County,

Figure 1. Serious delinquency or in foreclosures, monthly rate, 2008-2017



Source: McDash Analytics.

14 of which encompass suburban communities; the remaining 19 comprise city communities. The PUMA areas are named after the most prominent central municipality or Chicago community area that they contain.

Table 1 reports the median household income in places (PUMA) in Cook County by decreasing order of inflation-adjusted income in 2000. The results make clear the large socioeconomic variations across these local areas. As can be seen, the median income of areas on the lowest end of income spectrum, for example, (Douglas, Grand Boulevard, Oakland, Kenwood, Hyde Park, Washington Park, Woodlawn, and South Shore) is 36 percent of the median income of those areas on the highest end of income in the Northwest Chicago suburbs. Interestingly, both communities in low and upper end of the socioeconomic spectrum have seen some increases/decreases in median income (adjusted for inflation), reflecting various population and sociodemographic shifts within and across communities in the county. Census data suggest that in recent years, places on the South Side of Chicago have seen strong population declines, especially predominantly black communities,[6] while the city of Chicago is a popular destination with educated millennials.[7]

Meanwhile, some of the suburbs are also seeing lower median household income with a more recent phenomenon dubbed suburbanization of poverty (Kneebone and Holmes, 2016; Kneebone, 2017).[8]

As table 1 shows, some northern suburbs of Chicago, namely Northbrook, Glenview, Wilmette, Winnetka, Glencoe, and Northfield, have seen the largest increase in income. Also other areas on the North Side of Chicago, and in central, and northwest areas of Chicago have had increases in median income (e.g., Rogers Park, Edgewater, Uptown, Lakeview, Lincoln Park, North Center, Lincoln Square, West Ridge, Forest Glen, North Park, Albany Park, Irving Park, Hermosa, Avondale, Logan Square, West Town, Near West Side, Lower West Side, Near North Side, Loop, and Near South Side). By contrast, most areas on the south and west sides of Chicago, which are on the lowest end of the income spectrum, and many of which are predominantly minority (black and Hispanic) neighborhoods, have seen decreases in income from 2000.

The data

For the formal analysis of this article estimating the hedonic price model, we compile a large dataset made of all detached single family property transactions recorded in Cook County from 1997 to 2017.[9] We construct a series of variables from various data sources related to the characteristics and location of properties in our sample. We also construct various measures of accessibility, in addition to distance to the central business district in Chicago, to take into consideration the specific spatial context of the county. Finally, we construct (indicators of) measures of housing distress.

Table 2 lists the variables that we include in the analysis, along with the mean values of these variables. Sales price data on single family sales activity (the dependent variable in the model) was taken from three sources: 1) property transfer records the Cook County Recorder of Deeds via Property Insight;[10] 2) sales records from Midwest Real Estate Data (MRED); and 3) the Northwest Illinois Multiple Listing Service (MLS). Property characteristics include building structure, square footage, number of bathrooms and bedrooms, and age of the building. These data come from the Cook County Assessor and the Northwest Illinois MLS.

Table 1. Characteristics of local housing markets in Cook County, Illinois

PUMA	Area location	Cook County	Area name	Not inflation-adjusted median household income, 2000	Inflation-adjusted median household income, 2000	Inflation-adjusted median household income, 2015	Change in inflation adjusted median household income, 2000–2015
3401	Northwest	Chicago suburbs	Palatine, Barrington, Barrington Heights, South Barrington, Inverness, Rolling Meadows	82,090	111,042	103,000	-.07
3421	North	Chicago suburbs	Evanston, Skokie, Morton Grove, Lincolnwood	79,830	107,985	80,000	-.26
3416	Northeast	Chicago suburbs	Northbrook, Glenview, Wilmette, Winnetka, Glencoe, Northfield	75,300	101,857	158,900	.56
3410	Southwest	Chicago suburbs	Orland Park, Palos Hills, Palos Park, Lemont	73,000	98,746	90,000	-.09
3502	North	Chicago city	Lakeview, Lincoln Park	72,900	98,611	120,000	.22
3420	North	Chicago suburbs	Norwood Park, Des Plaines, Park Ridge, Edison Park	69,800	94,417	92,000	-.03
3415	North	Chicago suburbs	Wheeling, Prospect Heights, North Arlington Heights	69,260	93,687	85,000	-.09
3419	Northwest	Chicago suburbs	South Arlington Heights, Elk Grove Village, Mount Prospect	69,260	93,687	85,000	-.09
3417	Northwest	Chicago suburbs	Streamwood, North Bartlett, Hoffman Estates	67,570	91,401	80,370	-.12
3418	Northwest	Chicago suburbs	Schaumburg	67,570	91,401	77,900	-.15
3409	West Central	Chicago suburbs	Bedford Park, Burbank, Stickney, McCook, North Bridgeview, LaGrange	65,000	87,924	79,690	-.09
3407	West Central	Chicago suburbs	Riverside, Forest Park, River Forest, Maywood, Bellwood, Broadview, Westchester, LaGrange Park, Hillside, Melrose Park	61,300	82,920	69,700	-.16
3530	South	Chicago city	Ashburn, Beverly, Washington Heights, Morgan Park, Mount Greenwood	60,200	81,432	75,000	-.08
3412	South Central	Chicago suburbs	Markham, Oak Forest, Country Club Hills, Hazel Crest, Midlothian	60,000	81,161	73,400	-.10
3414	South	Chicago suburbs	Chicago Heights, Matteson, Flossmoor, Lynwood, Park Forest, Richton Park, Glenwood, Sauk	58,300	78,861	63,600	-.19
3520	Northwest	Chicago city	Dunning, Portage Park, Jefferson Park	57,490	77,766	74,500	-.04
3422	West	Chicago suburbs	O'Hare, Rosemont, Schiller Park, Franklin Park, River Grove, Elmwood Park	57,000	77,103	68,000	-.12
3411	South Central	Chicago suburbs	Oak Lawn, Alsip, Blue Island, Evergreen Park, Worth, Chicago Ridge	55,300	74,803	64,000	-.14
3525	Central	Chicago city	Near North Side, Loop, Near South Side	51,000	68,987	116,000	.68
3408	Central	Chicago suburbs	Cicero, Oak Park, Berwyn	50,000	67,634	63,000	-.07
3504	Northwest	Chicago city	Forest Glen, North Park, Albany Park, Irving Park	50,000	67,634	72,400	.07
3413	Southeast	Chicago suburbs	South Holland, Harvey, Calumet City, Dolton, Lansing, Thornton	49,550	67,025	55,000	-.18
3527	Southwest	Chicago city	Garfield Ridge, Clearing, West Lawn, Gage Park, West Elsdon	48,600	65,740	60,200	-.08
3503	North	Chicago city	North Center, Lincoln Square, West Ridge	47,220	63,874	67,000	.05

PUMA	Area location	Cook County	Area name	Not inflation-adjusted median household income, 2000	Inflation-adjusted median household income, 2000	Inflation-adjusted median household income, 2015	Change in inflation adjusted median household income, 2000-2015
3521	West	Chicago city	Austin, Montclare, Belmont Cragin	45,000	60,871	42,600	-.30
3532	South	Chicago city	South Chicago, South Deering, Calumet Heights, East Side, Pullman, West Pullman, Riverdale, Hegewisch	41,700	56,407	35,130	-.38
3522	Northwest	Chicago city	Hermosa, Avondale, Logan Square	39,400	53,296	60,900	.14
3524	West	Chicago city	West Town, Near West Side, Lower West Side	39,000	52,755	77,700	.47
3528	South	Chicago city	Chicago Lawn, West Englewood, Englewood, Greater Grand Crossing	38,200	51,673	36,400	-.30
3526	Southwest	Chicago city	Armour Square, Bridgeport, New City, McKinley Park, Brighton Park, Archer Heights	37,850	51,199	36,900	-.28
3531	South	Chicago city	Auburn Gresham, Roseland, Chatham, Burnside, Avalon Park	36,800	49,779	36,000	-.28
3501	North	Chicago city	Rogers Park, Edgewater, Uptown	36,000	48,697	49,000	.01
3523	West	Chicago city	Humboldt Park, West Garfield Park, East Garfield Park, North Lawndale, South Lawndale	31,510	42,623	39,000	-.09
3529	South	Chicago city	Douglas, Grand Boulevard, Oakland, Kenwood, Hyde Park, Washington Park, Woodlawn, South Shore	30,000	40,581	37,600	-.07

Sources: Steven Ruggles, Katie Genadek, Ronald Goeken, Josiah Grover, and Matthew Sobek. Integrated Public Use Microdata Series: Version 7.0 [dataset]. Minneapolis: University of Minnesota, 2017. https://doi.org/10.18128/D010.V7.0. Consumer Price Index-All Urban Consumers (CPI-U), Chicago-Gary-Kenosha, Ill.-Ind.-Wisc., All Items. U.S. Department of Labor: Bureau of Labor Statistics. Washington, D.C. 20212, 2017.
Note: Older (2000) data is interpolated or is from a PUMA with consistent boundaries with the 2015 PUMA.The inflation adjustment uses the CPI Historical Estimates from the BLS for the Chicago CSA, specifically using the 1999 annual average for the 2000 census and the 2010 and 2015 annual averages for the ACS data and a base year of 2015.

The geographic control variables include distance from properties to Chicago Transit Authority (CTA) rail stations, to Lake Michigan, to any type of publicly-accessible open space, to Metra rail stations, and to a lake or river other than Lake Michigan.[11] Spatial data for parcels is obtained annually by the DePaul Institute of Housing Studies (IHS) from the Cook County assessor. Distances to CTA and Metra rail stations were calculated by joining the Cook County road network from the Cook County Data Portal and CTA and Metra rail station locations obtained from the City of Chicago Data Portal. Data on properties' proximity to Lake Michigan, on publicly accessible open space, and bodies of water other than Lake Michigan come from the Chicago Metropolitan Agency for Planning (CMAPs) land use file for 2005.

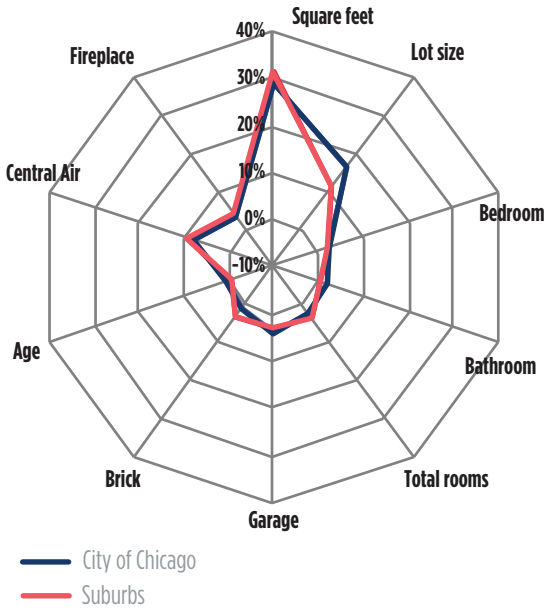
Indicators of housing market distress include short sale, sale at foreclosure auction, and sale occurring after a property entered REO status. Foreclosure distressed status was determined by identifying the date of a foreclosure filing on a property and tracking subsequent transaction activity. These data come from the Cook County Clerk and Cook County Recorder of Deeds via Property Insight.

Table 2. Factors affecting housing price

Variable name		Description of variable	Mean	Standard deviation	Minimum	Maximum
Sale price and distressed sale						
	log_price	Log of house price	12.17	.77	9.21	14.22
Property characteristics						
	log_sqft	Log square feet of building area	7.26	.41	5.99	9.21
	log_lot	Log square feet of lot size	8.61	.65	1.95	15.81
	bedroom	Number of bedrooms	3.30	.86	.00	10.00
	bathroom	Number of bathrooms (full, half)	1.55	.72	.00	9.50
	totalroom	Total number of rooms in the property	7.47	1.91	1.00	20.00
	garage	Number of cars in garage	1.80	.76	.00	9.00
	brick	= 1 if full or partial brick building	.55	.50	.00	1.00
	age	Building age or age after improvement	51.54	29.72	.00	199.00
	centralair	= 1 if central air conditioning	.77	.42	.00	1.00
	fireplace	Number of fireplaces	.46	.71	.00	9.00
Location and distance variables						
	waterfront	= 1 if located at waterfront	.01	.11	.00	1.00
	cta_stop	= 1 if withing 660 feet near CTA station	.01	.10	.00	1.00
	cc_cal_distance	Distance from central business district (CBD)	15.53	7.38	.33	36.55
	metra_stop	= 1 if located within a quarter mile of metra stop	.02	.12	.00	1.00
	pubopen	= 1 if having a public open space within 660 feet	.30	.46	.00	1.00
	michlake	= 1 if located within 1 mile from Lake Michigan	.03	.18	.00	1.00
	lake_river	= 1 if located within 660 feet from river and lake	.11	.31	.00	1.00

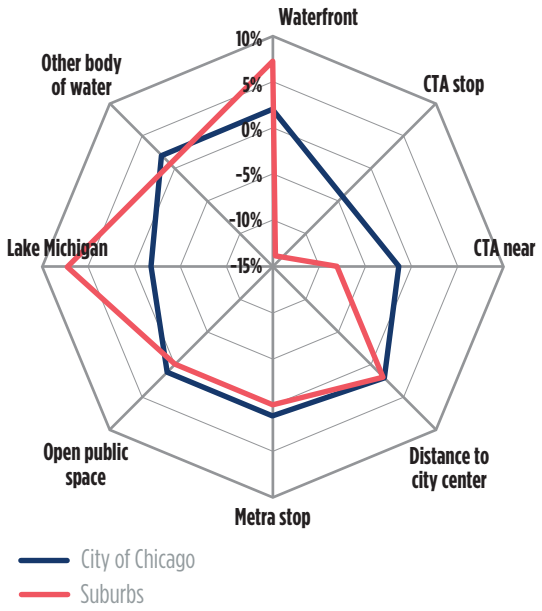
Sources: Authors' calculations, based on multiple sources of variables. Sales price is based on data from Cook County Recorder of Deeds via Property Insight, sales records from Midwest Real Estate Data (MRED) and from the Northwest Illinois Multiple Listing Service (MLS). Property characteristics variables are based on data for parcels from Cook County Assessor. Distance variables are based on data from Cook County Data Portal. CTA and Metra rail station variables are based on data from the City of Chicago Data Portal.

Figure 2A. Effects of housing structural characteristics on residential property price



Sources: Distress variables are based on data from the Cook County Clerk of the Court and Cook County Recorder of Deeds via Property Insight. Authors' calculations.
Note: Figures show the coefficient estimates of OLS hedonic housing price regression analysis. See Appendix A for the regression results for Cook County and for the city of Chicago and Cook County suburbs, respectively.

Figure 2B. Effects of proximity to amenities and of distance from CBD



Sources: Distance variables are based on data from Cook County Data Portal. CTA and Metra rail station locations data are based on data from the City of Chicago Data Portal. Lake Michigan, publicly-accessible open space, and lakes and rivers other than Lake Michigan come from the Chicago Metropolitan Agency for Planning (CMAPs) land use file for 2005. Authors' calculations.
Note: Figures show the coefficient estimates of OLS hedonic housing price regression analysis. See Appendix A for the regression results for Cook County and for the city of Chicago and Cook County suburbs, respectively.

Results of empirical estimates

The results of the regression estimates of the hedonic housing price model, which show the effects of the specified characteristics on house price, are reported in Appendix A for Cook County and disaggregated by the city of Chicago and suburban Cook County. (Generally, we were able to explain close to 80 percent of the house price variations within local areas in Cook County using our model, based on the R-Square results.) We illustrate the results in Appendix A in figures 2A, 2B, and 2C for the city of Chicago and suburbs.

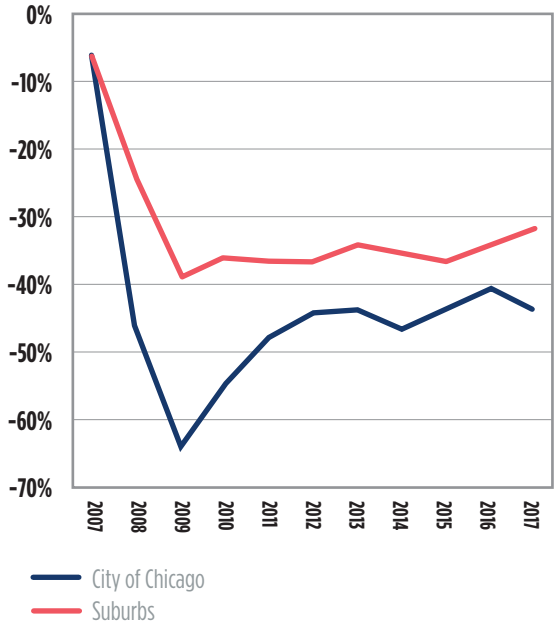
Housing characteristics: The effects of property characteristics are shown in figure 2A. We note that square footage and the lot size are the largest determinative features for housing price. That is, larger homes on average are associated with higher price. To be more precise, square footage contributes more than 30 percent to the value of homes in both the city of Chicago and the Cook County suburbs. Lot size contributes to increasing home price in the city by 16 percent and in the suburbs by 11 percent. In addition, the number of bedrooms, bathrooms, and total number of rooms, have a positive effect on house price. Other amenities, such as a garage, brick exterior, fireplace, and central air conditioning, all have a positive effect on house price. These factors contribute from 1 percent to 8 percent of the value of homes in the city and the suburbs.

Neighborhood characteristics and distances: Figure 2B shows the relationship between neighborhood characteristics and proximity to amenities and housing price. Waterfront properties in the suburbs are associated with higher housing price. Proximity to a CTA train stop has a stronger negative effect in the suburbs than

in the city of Chicago. Our analysis confirms more recent research, which found that contrary to the classical monocentric model, distance from the CBD is associated with higher housing prices, as opposed to lower. Lake Michigan is associated with higher prices in the suburbs, but lower prices in the city, as previous research of the Chicago market had found (Guerrieri, Hartley, and Hurst, 2010). Waterfront or proximity to other bodies of water (lakes, rivers) increases prices of residential homes in both the city of Chicago and Cook County suburbs.

Distressed sale effects: Figure 2C shows the effect of distressed sales from each year between 2007 and 2017. The distressed sale/year interaction variables return (highly negative) significant effects on house price. The effects, interestingly, are stronger in the city than the suburbs. To illustrate, before the housing crisis, in 2005 with the distressed sale/year coefficient estimates of -0.06 in the city of Chicago and in the suburbs, this means that assuming a median sale price of $187,500, a distressed sale would barely drop the price of the home. But consider the coefficient estimate in 2009 at the height of the housing market crisis, with a coefficient estimate of -0.64 for the city of Chicago and -0.39 in the suburbs; this means that assuming a median sale price of $187,500, a distressed sale would drop the price of the property to $86,250 in the city of Chicago or to $114,375 in suburban Cook County. For the most recent year for which we conduct this analysis, 2017, again assuming a median sale price of $187,500 with coefficient estimates of -0.43 in the city of Chicago and -0.31 in the suburbs, the distressed sale would drop the price of the property to $105,855 in the city or to $127,892 in the suburbs.

Figure 2C. Effects of distressed housing on residential property price



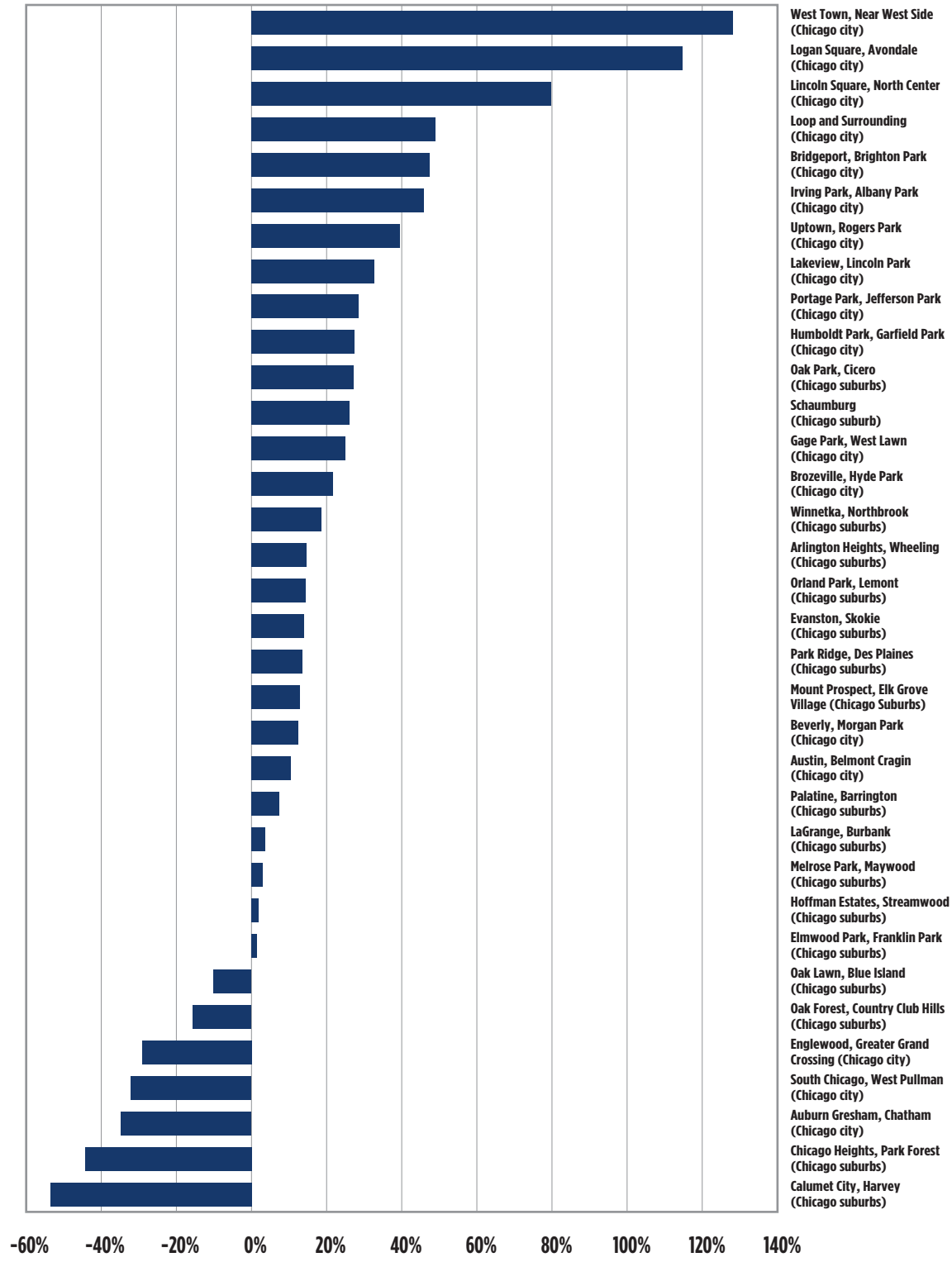
Sources: Distress variables are based on data from the Cook County Clerk of the Court and Cook County Recorder of Deeds via Property Insight.
Note: Figures show the coefficient estimates of OLS hedonic housing price regression analysis. See Appendix A for the regression results for Cook County and for the city of Chicago and Cook County suburbs, respectively.

Home values and low-income markets

As mentioned, the hedonic model estimates allow for the development of an index tracking price and changes over time for specific geographies.[12] We use the estimated average price level on the condition of all the control variables from the model presented to derive price indices for Cook County, the city of Chicago, and the housing submarkets (PUMAs). We are particularly interested in understanding how prices have evolved for low-income submarkets relative to high-income submarkets.

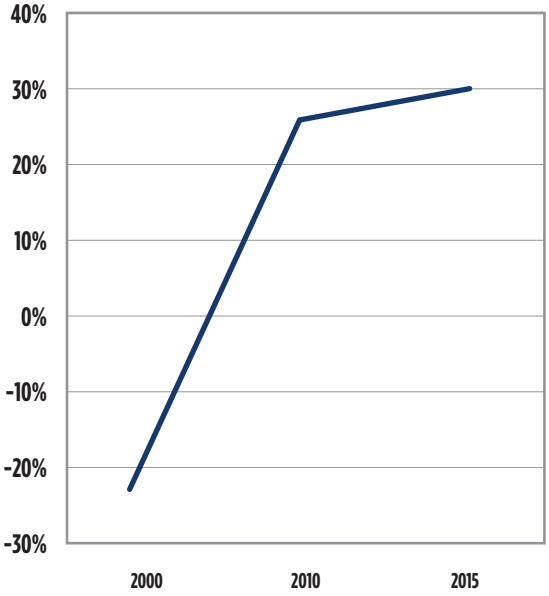
Figure 3 shows the differences in the price index for each PUMA, relative to the county in 2017. Places near north and south of the central business district (the Loop), namely, West Town, Hermosa, Avondale, Logan Square, and Lincoln Square have the highest prices relative to the county as a whole. Also, places in northeast, northwest, and north suburbs have relatively higher housing prices than the county. These are areas of higher income (see table 1), and they include Northbrook, Glenview, Wilmette, Winnetka, Glencoe, and Northfield, as well as south suburbs, such as Orland Park, Palos Hills, Palos Park, and Lemont. By contrast, lower-income, South Side neighborhoods of the city of Chicago, namely Auburn Gresham, Roseland Chatham, Burnside, Avalon Park, as well as south Chicago suburbs, such as Chicago Heights, Matteson, Flossmoor, and other Chicago north suburbs like South Holland and Harvey, have lower housing prices, relative to the county (average).

Figure 3. Housing price index differences in Cook County submarkets – Q2 2017



Sources: House price index is derived from a hedonic house price regression analysis that includes property characteristics, location and distance variables, and distress indicators, based on a multitude of sources. Sales price is based on data from Cook County Recorder of Deeds via Property Insight, sales records from Midwest Real Estate Data (MRED) and from the Northwest Illinois Multiple Listing Service (MLS). Property characteristics variables are based on data for parcels from Cook County Assessor. Distance variables are based on data from Cook County Data Portal. CTA and Metra rail station variables are based on data from the City of Chicago Data Portal. Distress variables are based on data from the Cook County Clerk of the Court and Cook County Recorder of Deeds via Property Insight. Authors' calculations.

Figure 4. Correlation between price and the income level of neighborhoods in Cook County



Sources: Author's calculations based on income data from Integrated Public Use Microdata (IPUMS) series, and house price index derived from a hedonic house price regression analysis.

In figure 4, we report the correlation between income and housing price, and confirm that there is a positive relationship between home price and the income level of the neighborhood. But what is more important to note is the fact that the relationship has increased over time, from being negative in the early 2000s to becoming more positive post the housing market crash. This suggests that housing prices have become even closer to the income level of the area in Cook County, reflecting stronger housing market segregation based on socioeconomic income of the neighborhoods.

Variation in price cycles and price shocks from housing market crisis

Figure 5 gives a bird's-eye view of the annualized growth rate (in price index) for each PUMA; we note the price change ranging from negative or no growth to up to 8 percent annual growth rate in some areas. We focus on specific areas to understand better the variation in the price cycles across the different submarkets by examining the trend in price, as well as measuring the drop in price (price shocks) during the housing market crisis. Prices in Cook County declined by more than 40 percent between 2007 and 2012; but between 2012 and 2017, housing prices increased by more than 30 percent (figure 6).

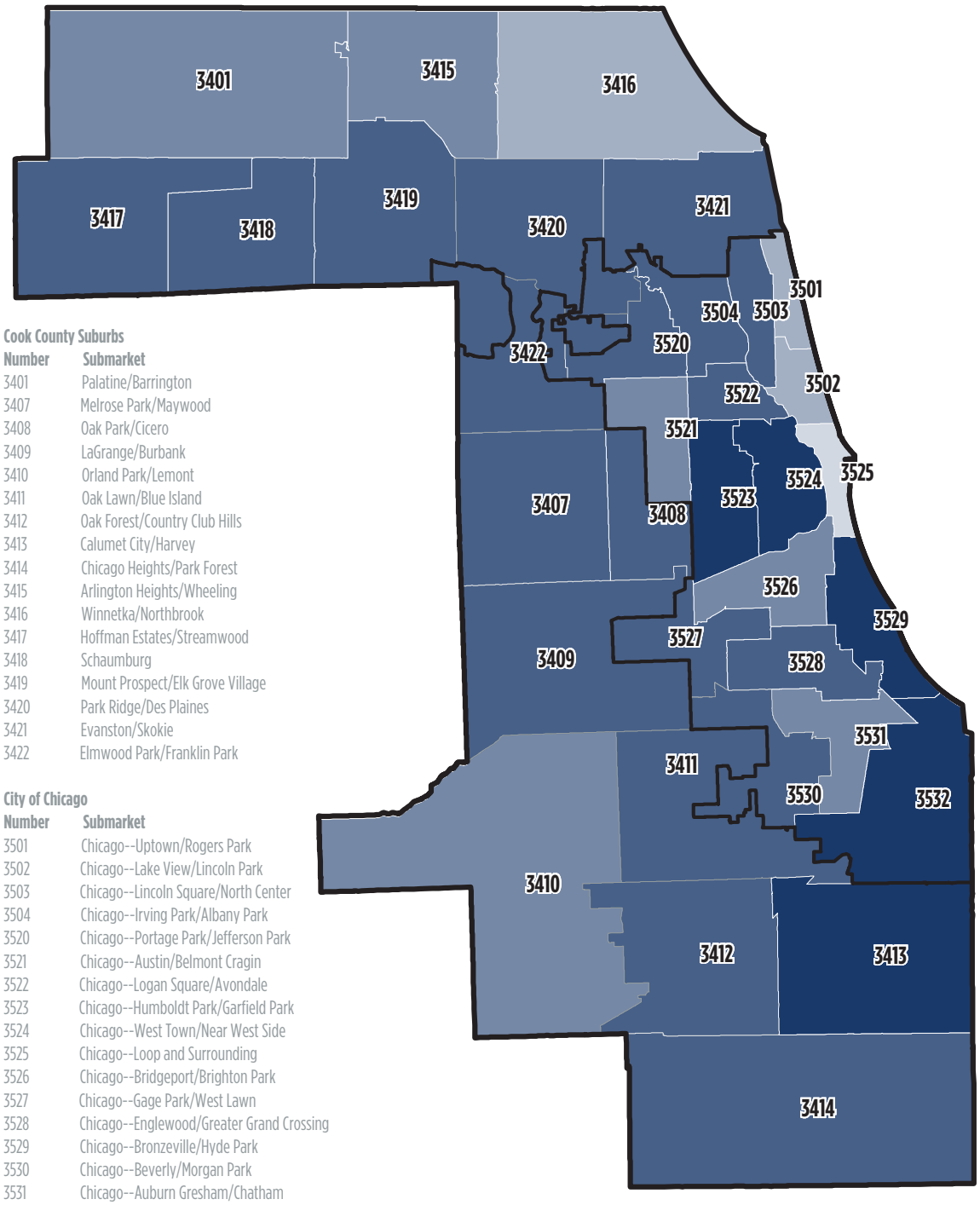
The sets of figures in Appendix B show the price cycles and the drop in housing price covering the housing crisis period (2007-2012), respectively, for the various submarkets (PUMA), grouped by areas (i.e., north, south, etc.). As revealed, the effects of the housing market crash on home prices were uneven across submarkets within each area. Notably, none of the PUMAs in the north had price decline as steep as the county. In the south, all the PUMAs had price decline steeper than the county (with the exception of Ashburn, Beverly, Washington Heights, Morgan Park, and Mount Greenwood).

Variations in housing market recovery across local housing markets

We analyze the extent to which the local housing markets are recovering by examining the change in price in Q4 2017, from peak prices (Q4 2007) in each of the submarkets. The differences across the different submarkets are worth noting (figure 6). Cook County's home prices have not yet exceeded their previous peak (in nominal terms). In Cook County, home values were still 20 percent less from the previous peak (in Q2 2017), and strong differences exist by submarkets. In some places, prices have surpassed their previous peak significantly. For example: in Hermosa, Avondale, and Logan Square (Chicago city), prices are 12 percent above the previous peak; Near North Side and Near South Side of the Loop (downtown Chicago central business district), prices are 9 percent more than the previous peak; West Town, Near West Side and Lower West Side of the city prices are 15 percent more than the previous peak; and Near North Side of the city, including Lakeview, Lincoln Park, Lincoln Square, and West Ridge, prices are 9 percent above their previous peak. By contrast on the lower end of the income spectrum, in places like South Side neighborhoods of the city – Chicago Lawn, Englewood/West Englewood, and Greater Grand Crossing, prices are 56 percent lower than their previous peak.

Finally, figure 7 shows the share of neighborhoods in different income quartiles and the change in house prices from the previous peak, which makes it clear that the lower the income of the areas in the county, the slower they are recovering.

Figure 5. IHS price index – year over year change, Q2 2017 Cook County submarkets



Cook County Suburbs

Number	Submarket
3401	Palatine/Barrington
3407	Melrose Park/Maywood
3408	Oak Park/Cicero
3409	LaGrange/Burbank
3410	Orland Park/Lemont
3411	Oak Lawn/Blue Island
3412	Oak Forest/Country Club Hills
3413	Calumet City/Harvey
3414	Chicago Heights/Park Forest
3415	Arlington Heights/Wheeling
3416	Winnetka/Northbrook
3417	Hoffman Estates/Streamwood
3418	Schaumburg
3419	Mount Prospect/Elk Grove Village
3420	Park Ridge/Des Plaines
3421	Evanston/Skokie
3422	Elmwood Park/Franklin Park

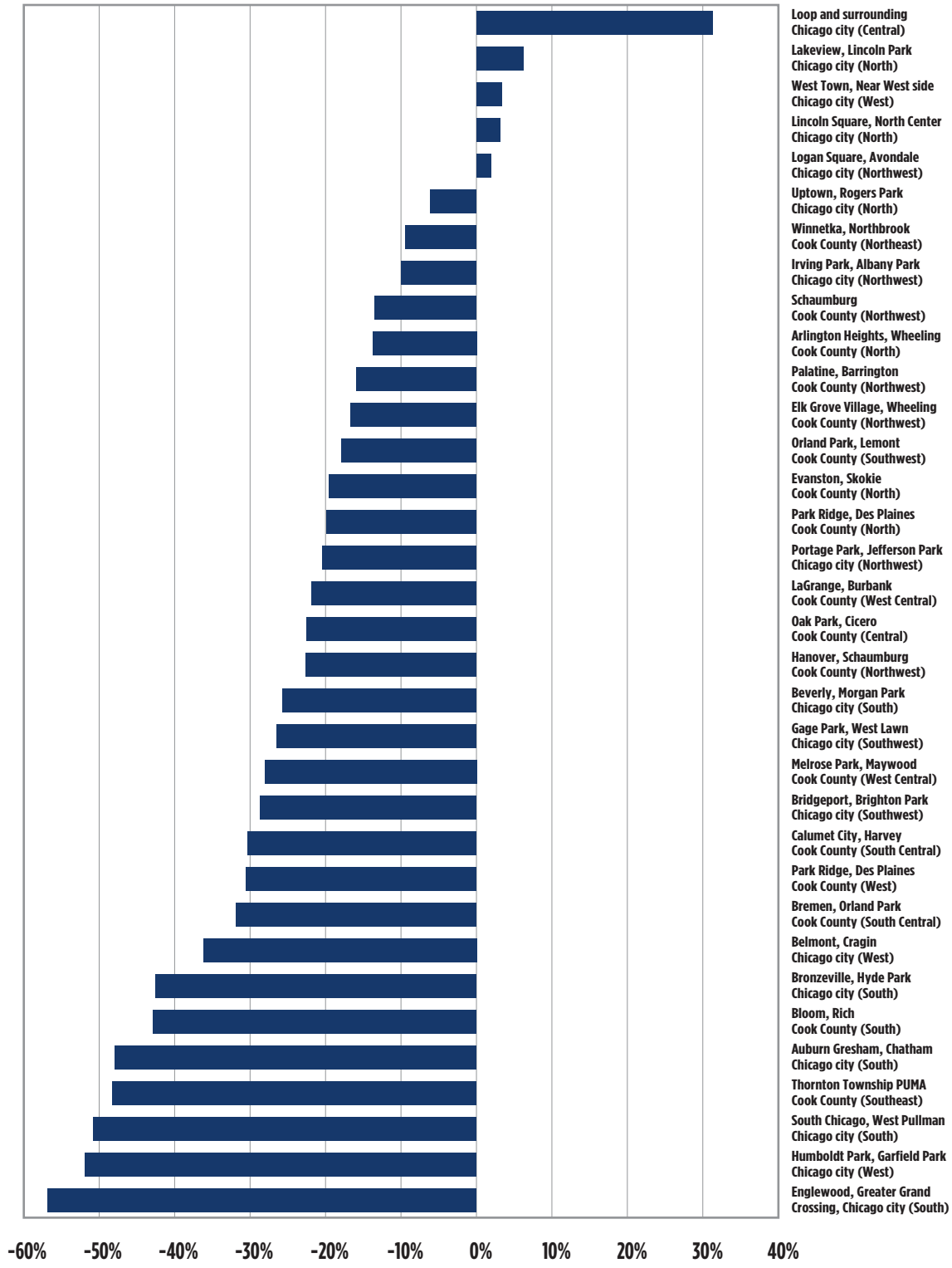
City of Chicago

Number	Submarket
3501	Chicago--Uptown/Rogers Park
3502	Chicago--Lake View/Lincoln Park
3503	Chicago--Lincoln Square/North Center
3504	Chicago--Irving Park/Albany Park
3520	Chicago--Portage Park/Jefferson Park
3521	Chicago--Austin/Belmont Cragin
3522	Chicago--Logan Square/Avondale
3523	Chicago--Humboldt Park/Garfield Park
3524	Chicago--West Town/Near West Side
3525	Chicago--Loop and Surrounding
3526	Chicago--Bridgeport/Brighton Park
3527	Chicago--Gage Park/West Lawn
3528	Chicago--Englewood/Greater Grand Crossing
3529	Chicago--Bronzeville/Hyde Park
3530	Chicago--Beverly/Morgan Park
3531	Chicago--Auburn Gresham/Chatham
3532	Chicago--South Chicago/West Pullman

More than 8.8 Percent
3.3 Percent to 8.7 Percent
0.1 Percent to 3.2 Percent
0 Percent or Less
Loop and Surroundings - Insufficient Data
Chicago City Boundary

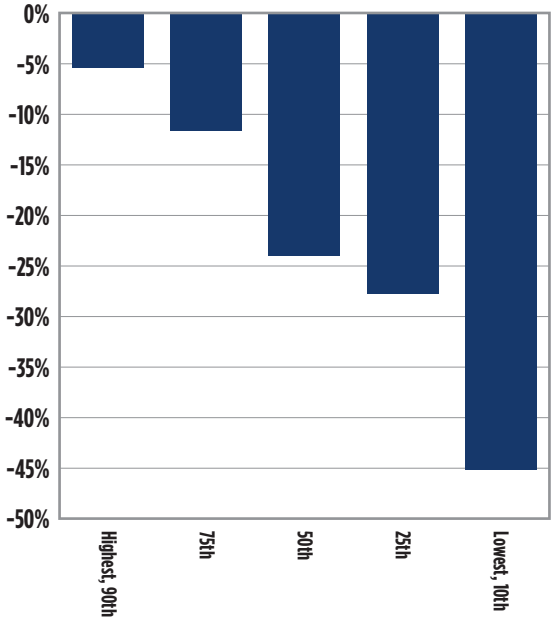
Source: IHS Data Clearing House.

Figure 6. Home values in 2017 relative to peak price before housing market crisis



Source: Authors' Calculations based on IHS data Clearing House.

Figure 7. Income quartile of neighborhoods and home values change from previous peak



Source: Authors' calculations based on BLS, ACS, and HIS Data Clearing House.

Conclusions and implications

We analyzed the determinants of home value and derived price indices for submarkets in Cook County based on a hedonic price model, which takes into consideration characteristics of homes, and of the location of homes, relative to specific amenities in the county. We find results that are consistent with expectations regarding the relationship of housing characteristics and proximity to various amenities and home prices. The model also allows examining the relationship between distressed sales and home prices. We find that the effects of distressed sales are still very potent a decade after the crisis.

According to the 2017 report from the Joint Center for Housing Studies of Harvard University (JCHS) on the State of Housing, home prices in the majority of metros have yet to fully recover from the foreclosure crisis, including in some markets where prices have risen sharply in recent years. For the nation, home prices in real terms were still 9 percent to 16 percent below the mid-2000 peak (as of 2016). (Although, in nominal terms, prices had gained somewhat in 2016 by at least 1.2 percent above the previous peak, according to the main information sources, such as the S&P Corelogic, Case-Shiller, and the Freddie Mac index). The JCHS report signaled that within these metro areas, home prices in low-income areas were slowest to appreciate.

We examined the relationship between the income level of neighborhoods and price, as well as price difference from previous peak to ascertain the extent to which the housing market is recovering and the difference across local areas in the county. We find results that are consistent with national results and those of other metropolitan areas. Since the recession, home prices in Cook County increased by 40 percent; however, home prices were still 10 percent below their peak in the county (in nominal terms). This slow recovery is driven by the deep and increasing disparities in income and socioeconomic conditions. In some of the lowest income quartile areas on the South Side of Chicago in the county, prices were more than 50 percent below their peak.

The relative lack of appreciation of homes in lower-income neighborhoods has several implications. On one hand, slow price appreciation may mean that these places may remain more affordable for low- and moderate-income households. On the other hand, and of greater concern is that the lack of price recovery in some markets also means that homeowners have little or no equity in their homes. In fact, the JCHS (2017) research reported that in Chicago, 12.6 percent of homeowners still had negative equity, which is more than double the national rate. Further, the share of low-income homeowners under water living in some neighborhoods exceeds 40 percent, with no opportunity to refinance or sell without bringing money to the closing table, according to the same report. Given high and increasing housing costs in much of the metro area, the market stagnation in some areas raises concerns about economic mobility of residents and continued disinvestment in places with persistently low home values.

Given the pivotal role of housing in contributing to the financial security and well-being of communities and households, attending to housing challenges remains a priority. The national debate should recognize the diversity within markets and consider the particular challenge that low-income neighborhoods still face, even within a metropolitan area where foreclosure rates have returned to a manageable level. The lingering effects of the housing market crash at the local levels means that policymakers should address specific community needs and marshall resources accordingly.

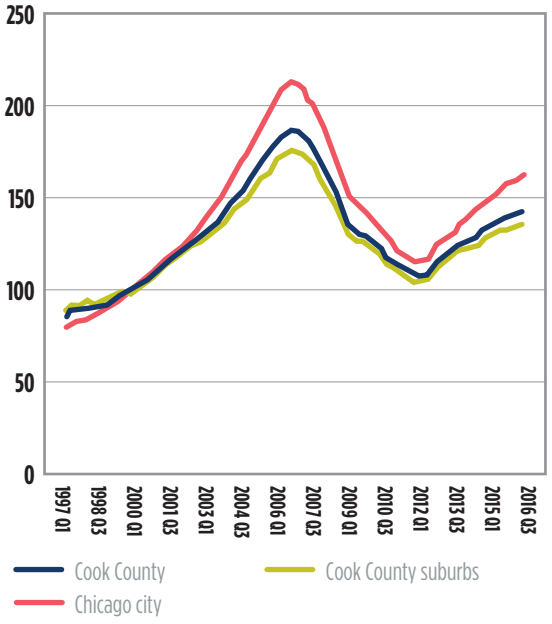
Appendix A. OLS regression estimates of the hedonic housing price model, which show the effects of the specified characteristics on house price in local housing markets (PUMA) in Cook County

		Cook County		Chicago		Suburbs	
		Parameter estimate	Standard error	Parameter estimate	Standard error	Parameter estimate	Standard error
	Intercept	8.7060	.0150	8.3465	.0348	8.9612	.0584
Property characteristics							
	log_sqft	.3141	.0010	.2919	.0019	.3136	.0012
	log_lot	.1170	.0005	.1641	.0016	.1098	.0005
	bedroom	.0153	.0004	.0172	.0006	.0170	.0005
	bathroom	.0059	.0005	.0158	.0010	.0022	.0005
	totalroom	.0315	.0002	.0235	.0003	.0348	.0002
	garage	.0348	.0003	.0383	.0006	.0312	.0004
	brick	.0272	.0005	.0115	.0011	.0317	.0006
	age	-.0045	.0000	-.0008	.0001	-.0054	.0000
	age square	.0000	.0000	.0000	.0000	.0000	.0000
	centralair	.0818	.0006	.0805	.0011	.0847	.0008
	fireplace	.0358	.0004	.0339	.0009	.0367	.0005
Location and distance variables							
	waterfront	.0566	.0020	.0129	.0046	.0661	.0021
	cta_stop	-.0740	.0055	-.0422	.0074	-.1409	.0090
	cta_near	-.0363	.0028	-.0154	.0036	-.0797	.0050
	cc_cal_dist	.0168	.0006	.0163	.0023	.0153	.0006
	metra_stop	-.0062	.0020	.0068	.0032	-.0078	.0026
	pubopen	.0032	.0005	.0096	.0012	.0002*	.0006
	michlake	.0360	.0035	-.0224	.0060	.0756	.0044
	lake_river	.0125	.0009	.0230	.0030	.0098	.0009
Distressed indicators							
	distressed sale	-.1040	.0012	-.1371	.0020	-.0827	.0015
	distressed sale *2007	-.0539	.0030	-.0627	.0051	-.0620	.0038
	distressed sale *2008	-.3308	.0028	-.4619	.0048	-.2434	.0035
	distressed sale *2009	-.4894	.0026	-.6431	.0045	-.3910	.0031
	distressed sale *2010	-.4368	.0026	-.5532	.0046	-.3619	.0032
	distressed sale *2011	-.4041	.0027	-.4777	.0049	-.3647	.0032
	distressed sale *2012	-.3887	.0025	-.4439	.0046	-.3643	.0029
	distressed sale *2013	-.3733	.0024	-.4404	.0044	-.3431	.0028
	distressed sale *2014	-.3882	.0027	-.4682	.0049	-.3533	.0031
	distressed sale *2015	-.3848	.0029	-.4375	.0055	-.3660	.0034
	distressed sale *2016	-.3590	.0031	-.4082	.0057	-.3431	.0036
	distressed sale *2017	-.3548	.0060	-.4354	.0109	-.3179	.0071
	R-Square	.7750		.7720		.7778	
	Adj R-Sq	.7749		.7718		.7778	

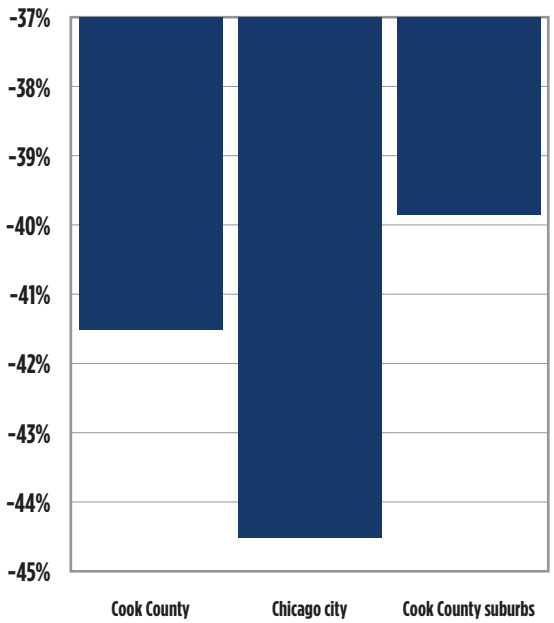
Sources: Authors' calculations, based on multiple sources of variables. Sales price is based on data from Cook County Recorder of Deeds via Property Insight; sales records from Midwest Real Estate Data (MRED); the Northwest Illinois Multiple Listing Service (MLS). Property characteristics variables are based on data for parcels from Cook County Assessor. Distance variables are based on data from Cook County Data Portal. CTA and Metra rail station locations data are based on data from the City of Chicago Data Portal. Distress variables are based on data from the Cook County Clerk of the Court and Cook County Recorder of Deeds via Property Insight.
Note: Fixed Effects - All results are controlled by the fixed effect of geographical area (Census Tract) and time of sales (year and quarter). The PUMA fixed effects control for any additional local neighborhood-specific factors, not measured/observed, which might affect individual house price. We also include year fixed effects, to control for macroeconomic effects on house price.
The r-square for all three models being .77 indicates that the variables in the models explain more than 75 percent of the house price variations within local areas. We note the fact that most of the coefficient estimates are largely consistent across the geographic regions of Cook County. All the variables are significant at 99 percent confidence interval. By controlling these annual distressed sales, we are able to calculate the general price changes after the financial crisis. Without the distressed dummy variables, there might be downward bias on the general house price trend due to relatively high concentrated distressed sales after 2007, particularly in certain areas with high levels of distressed sales. For example, if a community has higher level of distressed sales while housing turnover rate is relative low, the transactions from the distressed sales will be over-represented in the price index and that will rate relatively low, the transactions from the distress sales will be over-represented in the price index and that will create downward bias in overall price trends. All other variables are significant at 0.001 or 99 percent confidence interval.

Appendix B. Housing price index throughout Cook County and price decline throughout Cook County, Q2 2007 - Q2 2012

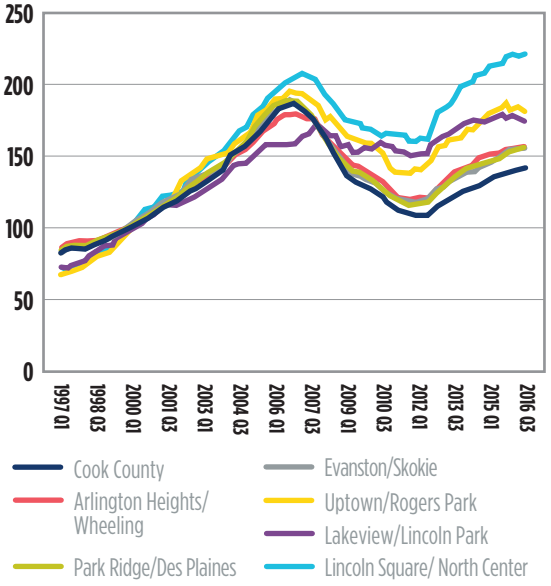
Appendix B1. Housing price index, Cook County



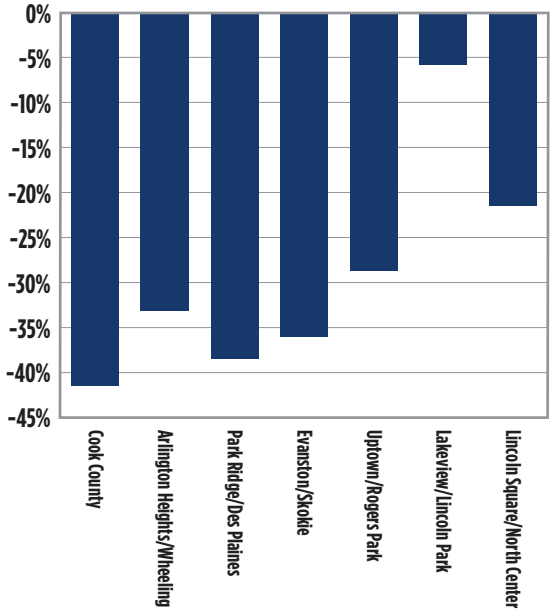
Appendix B2. Price decline, Cook County Q2 2007 - Q2 2012



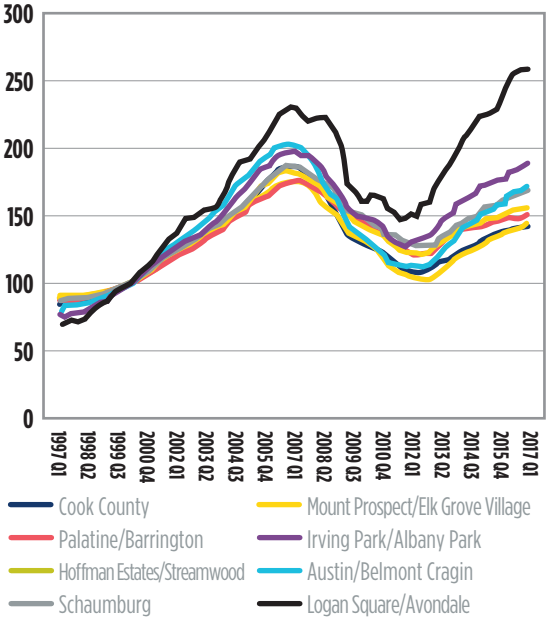
Appendix B3. Housing price index, north Cook County



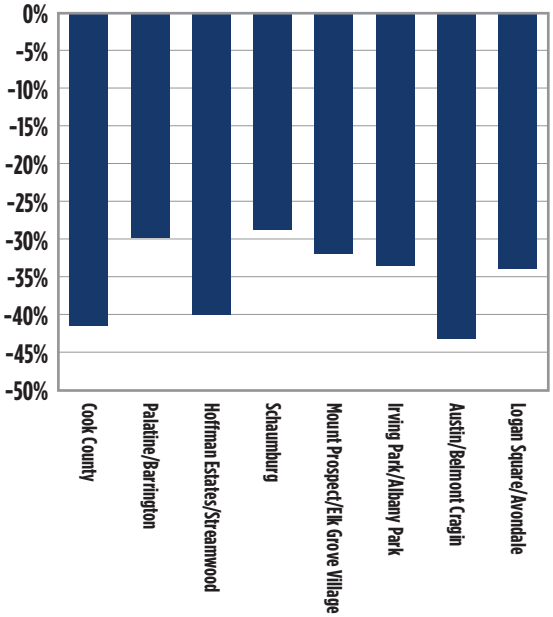
Appendix B4. Price decline, north Cook County Q2 2007 - Q2 2012



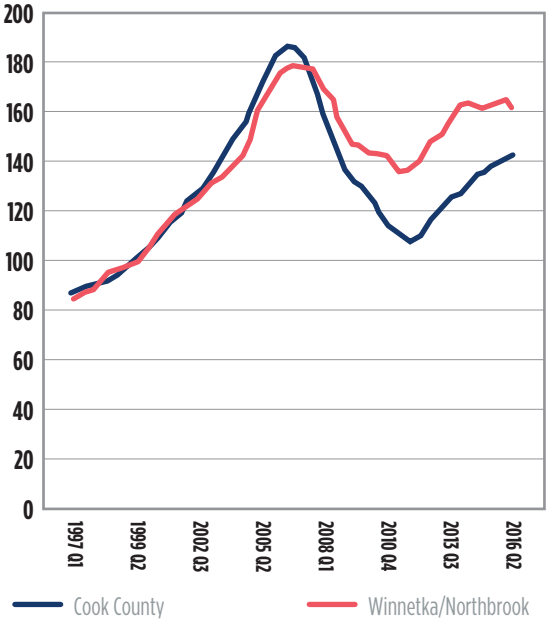
Appendix B5. Housing price index, northwest Cook County



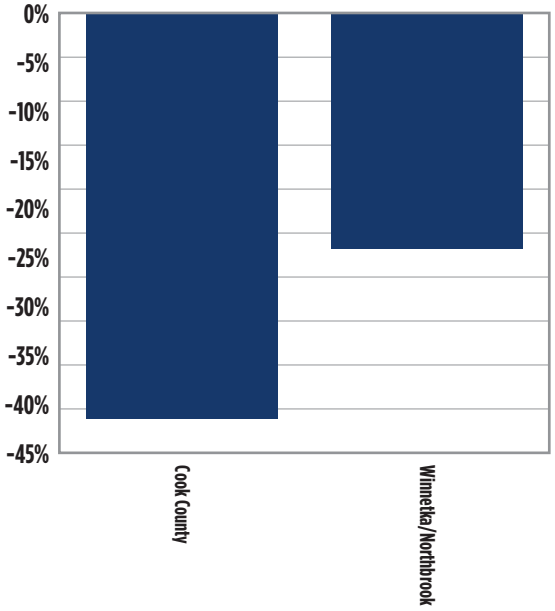
Appendix B6. Price decline, northwest Cook County Q2 2007 - Q2 2012



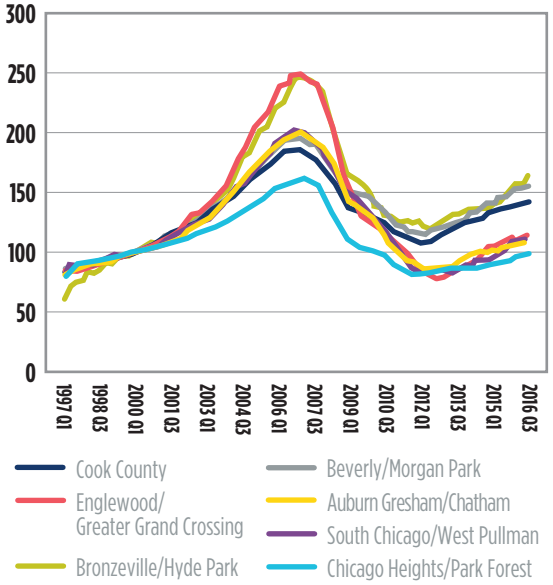
Appendix B7. Housing price index, northeast Cook County



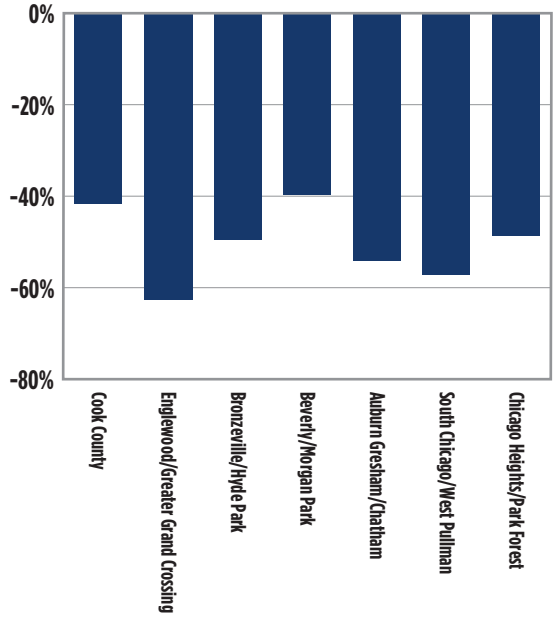
Appendix B8. Price decline, northeast Cook County Q2 2007 - Q2 2012



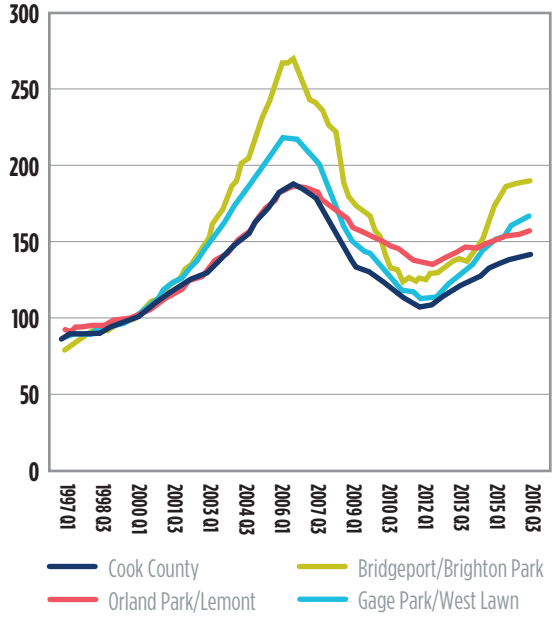
Appendix B9. Housing price index, south Cook County



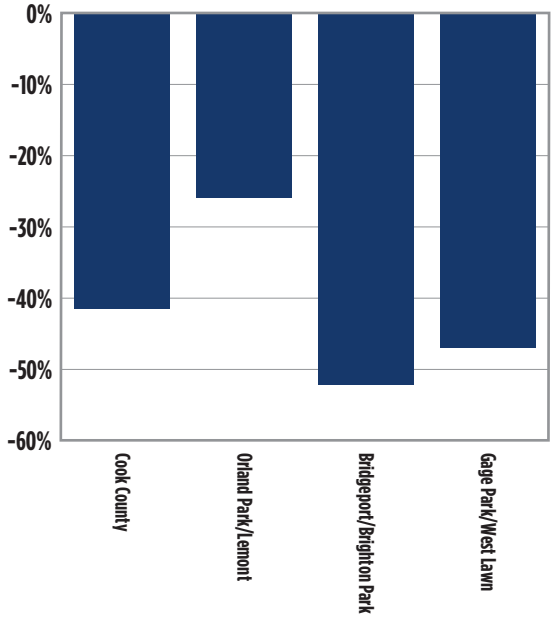
Appendix B10. Price decline, south Cook County Q2 2007 - Q2 2012



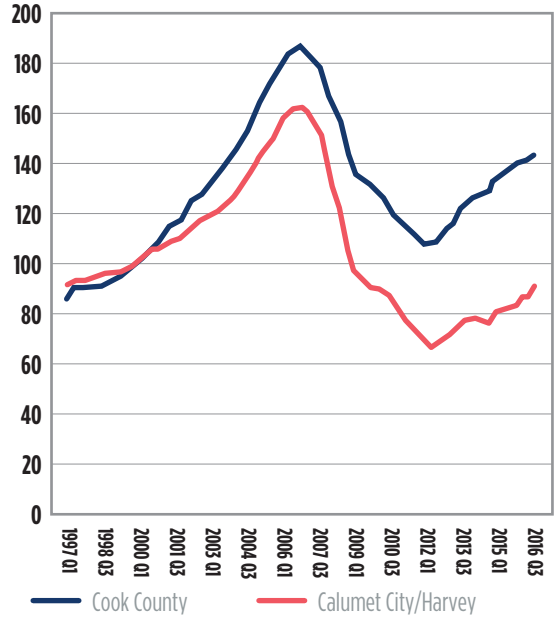
Appendix B11. Housing price index, southwest Cook County



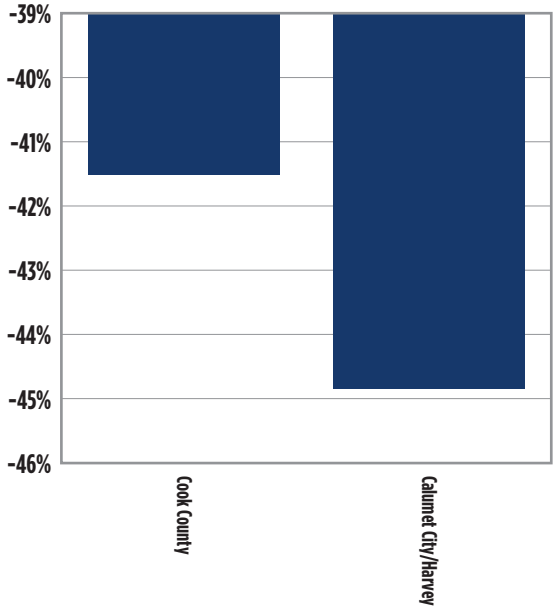
Appendix B12. Price decline, southwest Cook County Q2 2007 - Q2 2012



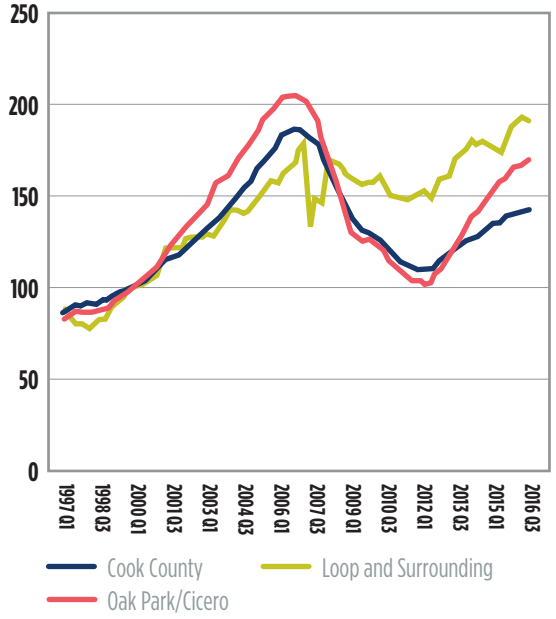
Appendix B13. Housing price index, southeast Cook County



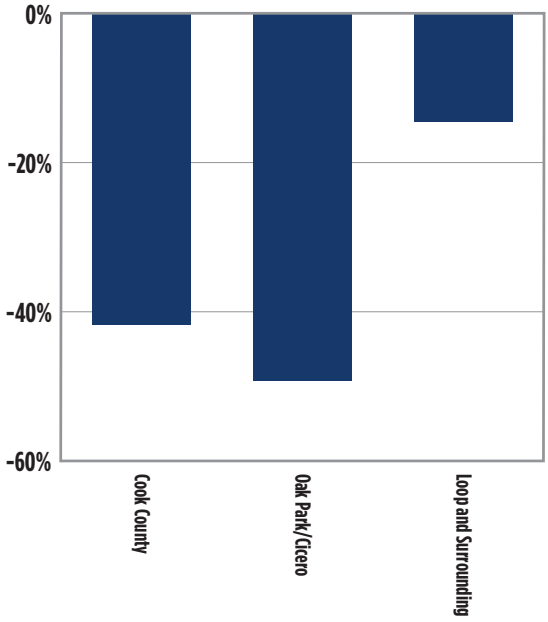
Appendix B14. Price decline, southeast Cook County Q2 2007 - Q2 2012



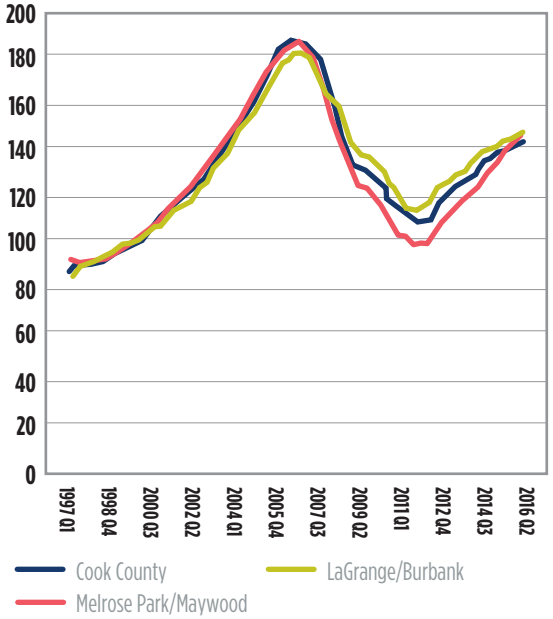
Appendix B15. Housing price index, central Cook County



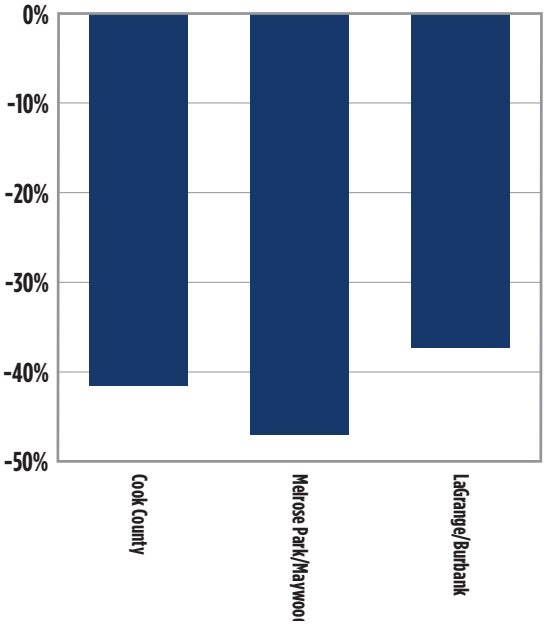
Appendix B16. Price decline, central Cook County Q2 2007 - Q2 2012



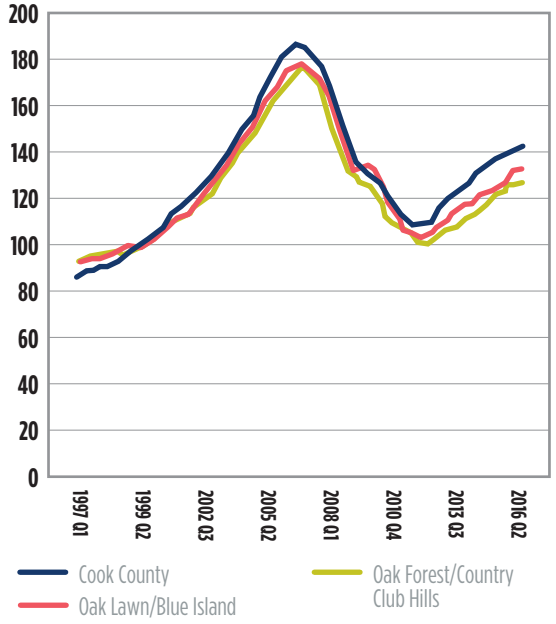
Appendix B17. Housing price index, west central Cook County



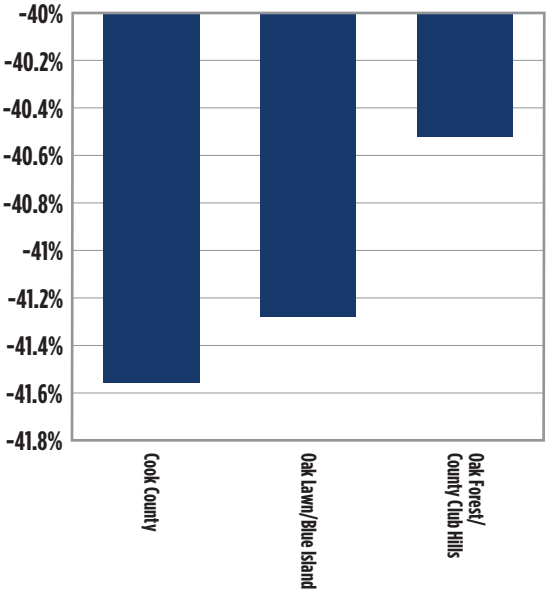
Appendix B18. Price decline, west central Cook County Q2 2007 - Q2 2012



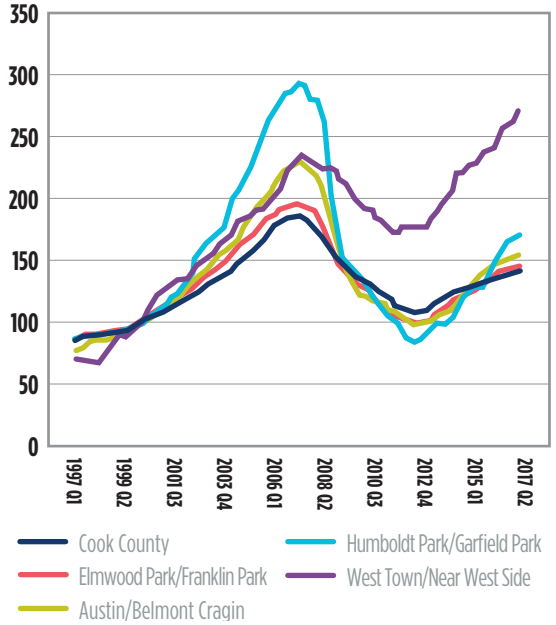
Appendix B19. Housing price index, south central Cook County



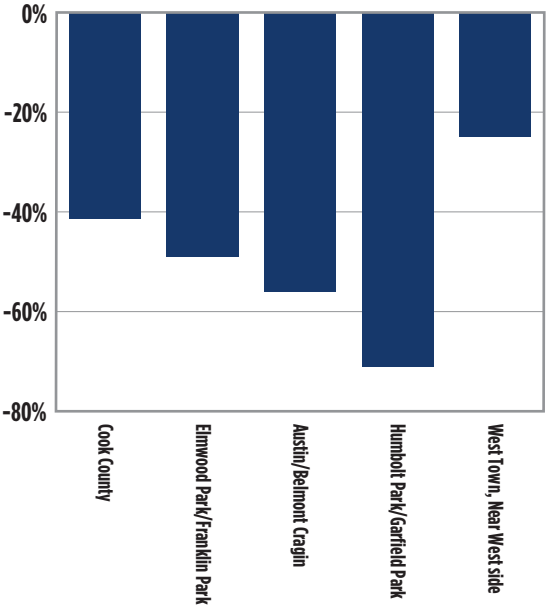
Appendix B20. Price decline, south central Cook County Q2 2007 - Q2 2012



Appendix B21. Housing price index, west Cook County



Appendix B22. Price decline, west Cook County Q2 2007 - Q2 2012



Source (for all figures in Appendix B): Authors' Calculations based on IHS Data Clearing House. https://www.housingstudies.org/data/ihs-price-index/cook-county-house-price-index-second-quarter-2017

Notes

1. See a more detailed review of the literature in John R. Ottensmanna, Seth Paytona, and Joyce Manb (2008); Bowen et al. (2001); Malpezzi (2003).
2. See Heikkila et al. (1989) for a review of studies of determinants of residential property or land values using hedonic models, saying that to the extent they have included location, it has generally been distance to the CBD.
3. Bender and Hwang (1985) review research, which does not lend support to the monocentric concept. Coulson (1991) likewise observed that prior research has had great difficulty in verifying the decline of land prices and land consumption with distance from the CBD, noting in particular that in tests of rent gradients, estimation has often yielded positive or insignificant values.
4. Judicial foreclosures states require the courts to get involved, which substantially slows down the process. By contrast, power-of-sale states allow the bank to sell the property without the court's supervision. States with Statutory Right of Redemption indirectly delay the resolution of a foreclosure by effectively limiting the demand pool that is willing to buy a foreclosed property. This law allows a foreclosed upon property owner to regain ownership for up to one year, even after it has been sold to someone else.
5. The scope of this study does not include a test of the contagion effects of foreclosures or the mechanisms by which it operates on nearby properties.
6. See http://www.chicagotribune.com/news/local/breaking/ct-black-population-declines-cook-county-met-20170621-story.html.
7. Chicago is the fifth most popular destination for millennials. See https://urbanmatter.com/chicago/chicago-millennials.
8. According to a report by Brookings Institute, almost every major metropolitan area experienced a significant increase in the suburban poor population from 2000 to 2015. See https://www.brookings.edu/testimonies/the-changing-geography-of-us-poverty.
9. For the purpose of the analysis, we excluded those properties where transactions repeated within 90 days to avoid any potential recording errors and to reduce potential bias in the price index due to frequently traded properties. Additionally, we dropped transactions where we found substantial missing information on essential property characteristics, such as the number of bedrooms, existence of an air conditioning system, or because of errors such as missing property identification numbers, or conflicting sales price information. We end up with a sample reflecting 75.7 percent of the transactions, for this analysis.
10. See http://www.propertyinsight.biz.
11. Geographic variables were calculated using ArcGIS software.
12. Additional details on the technical derivation of the price indices based on this model are provided in DePaul, Institute for Housing Studies, "Description of IHS Hedonic Data Set and Model Developed for PUMA Area Price Index," May 2015. See https://www.housingstudies.org/media/filer_public/2015/05/12/puma_hedonic_model_technical_paper_d7kh29N.pdf.

References

Alonso, W., 1964, *Location and Land Use*, Cambridge: Harvard University Press.

Agarwal, S., B. W. Ambrose, S. Chomsisengphet, and A. B. Sanders, 2012, "Thy Neighbor's Mortgage: Does Living in a Subprime Neighborhood Impact your Probability of Default?," *Real Estate Economics*, Vol. 40, No. 1, pp. 1–22.

Bajaj, V., and L. Story, 2008, "Mortgage Crisis Spreads Past Subprime Loans," *New York Times*, February 12.

Baumer, E. P., K. T. Wolff, and A. N. Arnio, 2012, "A Multicity Neighborhood Analysis of Foreclosure and Crime," *Social Science Quarterly*, Vol. 93, No. 3, pp. 577–601.

Bender, B., and H-S. Hwang, 1985, "Hedonic Housing Price Indices and Secondary Employment Centers," *Journal of Urban Economics* Vol. 17, No. 1, pp. 90–107.

Bowen, W. M., B. A. Mikelbank, and D. M. Prestegaard, 2001, "Theoretical and Empirical Considerations Regarding Space in Hedonic Housing Price Model Applications," *Growth and Change*, Vol. 32, No. 4, pp. 466–490.

Campbell, J. Y., S. Giglio, and P. Pathak, 2011, "Forced Sales and House Prices," *The American Economic Review*, Vol. 101, No. 5, pp. 2108–2131.

Coulson, N. E., 1991, "Really Useful Tests of the Monocentric Model," *Land Economics*, Vol. 67, pp. 299–307.

Day, B., I. J. Bateman, and I. Lake, 2007, "Beyond Implicit Prices: Recovering Theoretically Consistent and Transferable Values for Noise Avoidance from a Hedonic Property Price Model," *Environment and Resource Economics*, Vol. 37, No. 1, pp. 211–232.

Des Rosiers, F., M. Thérault, and P-Y Villeneuve, 2000, "Sorting out Access and Neighbourhood Factors in Hedonic Price Modelling: An Application to the Quèbec City Metropolitan Area," *Journal of Property Investment and Finance*, Vol. 18, No. 3, pp. 291–315.

Ergungor, O. E., and L. Nelson, 2012, "The Impact of Recovery Efforts on Residential Vacancies," Federal Reserve Bank of Cleveland, working paper, No. 12-03.

Guerrieri, V., D. Hartley, and E. Hurst, 2010, "Endogenous Gentrification and Housing Price Dynamics," NBER Working Paper No. 16237.

Hartley, D., 2014, "The Effect of Foreclosures on Nearby Housing Prices: Supply or Disamenity?," *Regional Science and Urban Economics*, Vol. 49, pp. 108–117.

Heikkila, E., P. Gordon, J. I. Kim, R. B. Peiser, H. W. Richardson, and D. Dale-Johnson, 1989, "Whatever Happened to CBD-Distance Gradient?: Land Values in a Policentric City," *Environment and Planning* A, Vol. 21, No. 2, pp. 221–232.

Immergluck, D., and G. Smith, 2005, "Measuring the Effect of Subprime Lending on Neighborhood Foreclosures: Evidence from Chicago," Urban Affairs Review, Vol. 40, No. 3, pp. 362–89.

Immergluck, D., and G. Smith, 2006, "The External Costs of Foreclosure: The Impact of Single-Family Mortgage Foreclosures on Property Values," *Housing Policy Debate*, Vol. 17, No. 1, pp. 57-79.

Joint Center for Housing Studies of Harvard University (JCHS), 2017, *The State of the Nation's Housing*, available at http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/harvard_jchs_state_of_the_nations_housing_2017.pdf.

Kain, J. F, and J. M. Quigley, 1970, "Measuring the Value of Housing Quality," *Journal of the American Statistical Association*, Vol. 65, No. 330.

Kaplan, D. H., and G. G. Sommers, 2009, "An Analysis of the Relationship Between Housing Foreclosures, Lending Practices, and Neighborhood Ecology: Evidence from a Distressed County," *The Professional Geographer*, Vol. 61, No. 1, pp. 101–120.

Katz, L., and K. T. Rosen, 1987, "The Interjurisdictional Effects of Growth Controls on Housing Prices," *The Journal of Law and Economics*, Vol. 30, No. 1, pp. 149–60.

Kneebone, E., and N. Holmes, 2016, "U.S. Concentrated Poverty in the Wake of the Great Recession," March 31, available at https://www.brookings.edu/research/u-s-concentrated-poverty-in-the-wake-of-the-great-recession.

Kneebone E., 2017, "The Changing Geography of US Poverty," February 15, available at https://www.brookings.edu/testimonies/the-changing-geography-of-us-poverty.

Malpezzi, S., 2003, "Hedonic Pricing Models: A Selective and Applied Review," In T. O'Sullivan and K. Gibb (eds.), *Housing Economics and Public Policy*, Oxford: Blackwell Science.

McMillen, D. P, and J. F. MacDonald, 1990, "Employment Subcenters and Land Values in a Polycentric Urban Area: The Case of Chicago," *Environment and Planning*, Vol. 22, No. 12, pp. 1561–1574.

Mills, E. S., 1967, "An Aggregative Model of Resource Allocation in a Metropolitan Area," *The American Economic Review*, May, Vol. 57, No. 2, pp.197–210.

Muth, R. F., 1969, *Cities and Housing: The Spacial Pattern of Urban Residential Land Use*, Chicago: University of Chicago Press.

Osttensmann, J. R., S. B. Payton, and J. Y. Man, 2008, "Urban Location and Housing Prices within a Hedonic Model," *Journal of Regional Analysis and Policy*, Vol. 38, No. 1.

Pennington-Cross, A., 2006, "The Value of Foreclosed Property," *Journal of Real Estate Research*, Vol. 28, No. 2, pp.193–214.

Rosen, S., 1974, "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition," *Journal of Political Economy*, Vol. 82, No. 1, pp. 34–55.

Song, S., 1994, "Modelling Worker Residence Distribution in the Los Angeles Region," *Urban Studies*, Vol. 31, No. 9, pp. 1533–1544.

Seo, Y., and B. Mikelbank, 2017, "Spatially and Sequentially Heterogeneous Discounts of Distressed Property Values in Cuyahoga County, Ohio," *Housing Policy Debate*, Vol. 27, No. 4, pp. 570–583.

Biographies

Maude Toussaint-Comeau is a senior business economist in the Community Development and Policy Studies division of the Federal Reserve Bank of Chicago.

Jim Man Lee is a research director for the Institute for Housing Studies, DePaul University and Adjunct Professor, Department of Economics, Depaul University.

ProfitWise news and views

ProfitWise News and Views welcomes article proposals and comments from bankers, community organizations, and other readers. It is available at www.chicagofed.org/publications/profitwise-news-and-views/index.

You may submit comments or proposals, or request a subscription by writing to:

ProfitWise News and Views
Community Development and Policy Studies
Federal Reserve Bank of Chicago
230 South LaSalle Street
Chicago, IL 60604-1413

or request at CDPSEvents@chi.frb.org

Advisor
Alicia Williams

Managing Editors
Michael V. Berry
Susan Longworth

Assistant Editor
Mary Jo Cannistra

Contributing Editors
Jeremiah Boyle
Emily Engel
Steven W. Kuehl
Robin Newberger

Designer
Jennifer Shrader

Web Content Specialist
Britt Oliver