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Good Home Improvers Make Good Neighbors

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Abstract

Research on the determinants of home improvement activity generally ignores the neighborhood context in which homeowners live. However the condition and trends of the surrounding properties influence a homeowner's attitude toward his or her own house. This "neighborhood effect" is a situation where neighborhood conditions (including overall level of home improvement spending) impose costs and benefits or otherwise influence the behavior or actions of a homeowner. Similarly, the home improvement activities of an individual homeowner may impose costs and benefits on nearby property owners and thereby influence the general level of maintenance in the neighborhood. To the extent that the level of home improvement influences the desirability of a particular home or of homes on average in the neighborhood, these externalities can be measured by examining changes in home valuations.

Using the Metropolitan Surveys of the American Housing Survey, from 1995-2004, this paper analyzes the differences in real appreciation rates between neighborhoods with different levels of median home improvement spending, even for households with comparable levels of individual expenditures. This paper finds a modest but statistically significant neighborhood effect, which was strongest among those households which spend the least individually. For a given level of individual home improvement spending, the inflation-adjusted annual house price appreciation rate was 15% higher in high spending neighborhoods compared to low spending ones.

Introduction

Research on the determinants of maintenance and home improvement activity of homeowners is generally devoid of the neighborhood context in which a homeowner undertakes such behavior. Home improvement projects are seen as a way for new homeowners to customize their living space, or for existing homeowners to accommodate changes to the household, or as an additional investment in the value of the house. Further, the demographic characteristics of the homeowner, such as age, income, and race, are used as predictors of the level and type of home improvement expenditures.

Ignored in this research is the influence that general neighborhood conditions and actions of nearby property owners (including their general level of home improvement expenditures) may have on the home improvement decisions of homeowners. Omitting these "neighborhood effects" distorts the analysis of the individual homeowner home improvement decisions, as well as fails to capture the full social benefits of individual home improvement activity. In particular, understanding such external effects and spillovers is important for predicting home improvement behavior and for shaping public policies, which are often predicated on such externalities. This paper aims to review the literature on external effects associated with home improvement activity and housing values, find empirical evidence of an independent effect of neighborhood maintenance and improvement spending on house value appreciation, and discuss its meaning and significance.

Simple Assessment of Homeowner Decision-Making

In traditional economic theory, homeowners are thought of as both the tenant and landlord of their home (Winger 1973). In this framework, home improvement involves both investment and consumption elements. Home improvement and maintenance will increase the flow of housing services the household enjoys, where housing services include the size, quality, location and other attributes of the home. Home improvement will also influence the likely sale price of the home in the future, where house value reflects the quantity and price of the housing services provided. Finally, the relative importance of the investment and consumption benefits is influenced by how long the owner plans to remain in the unit, a time horizon that is in part determined by the demographic characteristics of the homeowner, such as age and income.

Previous research by the Joint Center for Housing Studies has discovered several such internal determinants. Baker and Kaul (2000) found higher income homeowners, occupants of older homes, and households having completed a home improvement in the previous two years, were associated with an increased probability of having home improvement expenditures. Further, homeowners with higher levels of education, owners that had lived in their homes longer, households other than married couples, and blacks were more likely to hire professionals than undertake improvements themselves. Meanwhile, owners in the Midwest and West, and owners in suburban locations were more likely to undertake Do-It-Yourself (DIY) projects. Bendimerad (2005) found peak remodeling activity occurs when a person is between the ages of 35-45 and that younger households tended towards DIY projects, while older households hired professionals.

This paper focuses on changes in reported house value, which is a determinant of home improvement activity. Ziegert (1990) found anticipated increases in house value led residents to invest more in home improvements in order to capture future potential capital gains, as well as reallocate expenditures from nondurable to durable goods. These changes were motivated by both investment potential and housing consumption.

Changes in house value are also a result of home improvement activity by altering the quantity of housing services provided. *Remodeling Magazine* and the National Association of Realtors creates an annual "Cost vs. Value Report" using surveys for contractors and suppliers for cost, and appraisers, sales agents, and brokers for value (Alfano 2007). For 2007, the estimated share of home improvement costs recouped through increases in the value of the house ranged from 57 percent for a mid-range home office remodeling to 88 percent for upscale siding replacement. The fact that less than the full cost is recouped is indicative that 1) some projects are not discretionary but are necessary to maintaining the integrity of the house; and still manage to increase the value of the house, and 2) the study only captures the investment benefit of home improvements and not the increase in consumption benefits included in the implicit rent.

External Costs and Benefits

In addition to the demographic characteristics of the homeowner, external factors can also affect the discount rate applied to future housing services. In a pioneering article on the subject, Galster and Hesser (1982) argue that the condition of the surrounding neighborhood shapes the homeowner's perception of the quality, and therefore the value of housing services of

his or her unit. Further, tenant satisfaction influences expectations of likely duration of tenure, which affects the discount rate applied to housing services.

On the other hand, by influencing the condition of the neighborhood, home improvement activities yield additional social benefits which are external to the individual housing unit and not necessarily incorporated into an individual's home improvement decisions. Blazenko and Pavlov (2005) note that if homeowners fail to account for the spillover benefits of home improvement activity, less than socially optimal property maintenance will occur. Similarly, Winger (1973) points out that, as the beneficiary of a neighborhood spillover, a homeowner may maximize the present value of his or her property by under-maintaining it relative to the surrounding neighborhoods, thereby creating and maximizing the positive externality the neighborhood exerts on the homeowner's property. Either way, less than the socially optimal level of home improvement occurs, leading to lower property values, which further reduces the incentive to invest in additional housing services.

Galster and Hesser (1982) elaborate on how the neighborhood shapes the homeowner's maintenance and improvement decisions by distinguishing three dimensions neighborhood: the physical, the demographic, and the social:

> ***Physical***- Galster and Hesser cite numerous empirical studies showing that the physical condition of the surrounding neighborhood significantly affect household perceptions of that dwelling's quality and expectations of tenure.
>
> ***Demographic***- Galster and Hesser again cite studies stating that changes in the demographics of the neighborhood, such as median incomes, poverty rates, racial/ethnic composition, can affect homeowners' perceptions of neighborhood quality and consequently alter maintenance behavior in the same fashion as the physical condition of the neighborhood. Ioannides and Zabel (2003), identify this as the contextual neighborhood effect on housing demand, where homeowners view their neighbors' characteristics as a signal of future housing consumption and then alter their own consumption accordingly.

Social- Galster and Hesser argue:

> "The social dimension of neighborhood can be posited as affecting homeowners' maintenance behavior by encouraging them to conform to the other resident's norms as to what constitutes 'minimum acceptable' neighborhood housing quality…
>
> These social controls, where effective, should not only reduce the *variance* in maintenance levels in the neighborhood, but also increase the *mean* level by increasing each homeowner's perceived *marginal* benefits of maintaining (or, equivalently, increasing their marginal costs of *not* maintaining)."

Ioannides and Zabel identify this notion of "keeping up with the Joneses" as the endogenous neighborhood effect, where homeowners who view their neighbor's home improvement decisions will strive to keep up by making similar decisions.

Ellen and Voicu (2006) look at the flip side of this relationship. The condition of the neighborhood is seen as a consequence instead of a determinant of improvement activity. For the physical dimension, Ellen and Voicu argue that the removal of a disamenity (or creation of an amenity) eliminates the negative house price gradient radiating out into surrounding properties, but note that this "physical structure" effect depends upon the perceived quality and ongoing maintenance of the property. For example, a study by Temple University found that the sales price for houses within 150 feet of an abandoned property, which presumably was lacking adequate maintenance, was $7,627 less than a comparable house elsewhere, and that this negative impact weakened with distance (Temple University Center for Public Policy and Eastern Organizing Project, 2001). For the demographic dimension, Ellen and Voicu state that rehabilitation of a property can generate external benefits by increasing the population of the neighborhood, improving neighborhood safety and commercial demand. But they qualify this argument by saying the externality "may depend critically on the income and characteristics of incoming residents." Finally, for the social dimension, Ellen and Voicu argue that housing renovation can provide a market demonstration effect, helping to attract other investors by indicating economic viability.

On the geographic reach of these external factors, Galster and Hesser use four gradations of neighborhood with different physical and social characteristics: 1) roughly a one-block radius around the home, 2) a relatively homogenous area to which one has a socioeconomic attachment,

3) an area defined by jurisdictional lines or transportation arteries, and 4) "entire suburbs, townships, or sub-metropolitan regions." Most research of the externalities of rehabilitation and home improvement has focused on relatively small "primary" and "secondary" neighborhoods (roughly gradations 1-3). For example, Ulusoy (1998) restricts the analysis to 199 properties within a specific neighborhood of Pittsburgh, PA and Ellen and Voicu analyze the effect on properties within 1,000 ft of subsidized housing sites, compared to the rest of the respective census tract, in New York City.

Ellen and Voicu found that public rehabilitation projects generated significant, positive external benefits. Galster and Hesser's analysis of surveys of households in Wooster, OH found higher levels of expenditures were associated with living in better physical quality and socially cohesive neighborhoods. One of the broadest studies of neighborhood externalities was by Boehm and Ihlandfeldt (1986). Their study interviewed a sample of homeowners in twenty neighborhoods in different cities selected to maximize variation. In addition, objective measures of the condition of the surrounding neighborhood were taken. The study found that homeowners would increase home improvement expenditures by $840 for every 10 percent reduction in the share of neighboring houses with observable external defects. Nevertheless, few studies have looked at the neighborhood effect at such geographies.

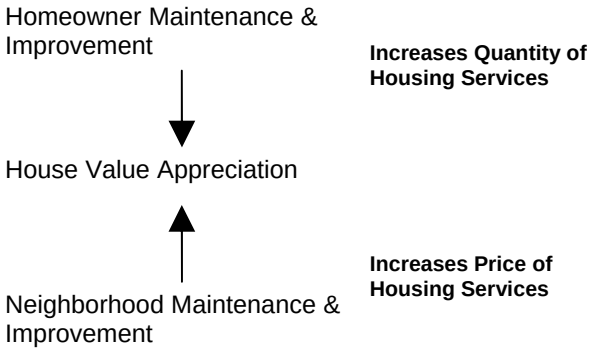
Approach

Boehm and Ihlanfeldt (1986) note the limited success econometric models have in explaining home improvement expenditures and argue this disappointment may be attributable to an intrinsically stochastic component of such expenditures—that expenditures reflect diverse preferences for housing consumption as much as measurable variables. There is also an inelastic nature to the timing of such expenditures—many home improvement projects are done out of necessity to replace broken or obsolete features. Nevertheless, this paper modestly hopes to reveal evidence of a neighborhood effect of home improvement expenditures.

Research Question

The primary question this paper intends to address is how neighborhood home improvement activity affects individual property value appreciation, independent of individual home improvements. Conceptually, when a homeowner undertakes a home improvement

activity, he or she is increasing the *quantity* of housing services provided, thereby increasing the value of the housing unit. However, the aggregation of these improvements increases the *price* of those services by making the neighborhood more desirable, ultimately increasing the house value of homeowners, even those who did not undertake any improvements themselves. In other words, this paper hopes to demonstrate the existence of an externality created by home improvement activity.



Of course, the world is far more complex. Innumerable other factors affect the price of housing services. Even the simultaneity in this relationship confounds proving causation, and data limitations prevent sophisticated analysis of intervening variables, such as developing a fully specified hedonic model of the determinants of house value. Consequently, this paper simply seeks to prove the existence of this relationship.

Data

This paper uses the American Housing Survey Metro (AHS-MS) files to analyze the neighborhood improvement-appreciation relationship at the sub-metropolitan level (Galster and Hesser's fourth gradation of neighborhood). Metros from the 1995 and 1996 AHS-MS surveys are matched with the next time they appear in the AHS-MS, either in 2002 or 2004. As a result, the time in between surveys ranges from seven to nine years. (See Exhibit 1).

Exhibit 1: Survey Years

Metro Name	MSA Code
seven years (1995, 2002)	
Charlotte, NC-SC	1520
Columbus, OH	1840
Kansas City, MO-KS	3760
Miami-Ft. Lauderdale, FL	5000
Portland, OR-WA	6440
eight years (1996, 2004)	
Atlanta, GA	0520
Cleveland, OH	1680
Hartford, CT	3280
Indianapolis, IN	3480
Memphis, TN-AR-MS	4920
Oklahoma City, OK	5880
Sacramento, CA	6920
St. Louis, MO-IL	7040
Seattle-Everett, WA	7600
nine years (1995, 2004)	
Denver, CO	2080
New Orleans, LA	5560
Pittsburgh, PA	6280
San Antonio, TX	7240

The geographic unit of analysis is the AHS variable zone. The only rigid requirement for zones is a population of at least 100,000 persons. However, the Department of Housing and Urban Development (HUD), the agency responsible for administering the AHS, attempts to meet four other criteria: 1) respecting political boundaries, 2) geographical contiguity, 3) homogeneity of demographic and housing characteristics, and 4) approximately equal distribution of population among the zones of a given metro. Nevertheless, zones are a "compromise among competing standards," and while algorithms and mathematical procedures are used, "the final zones are based on human judgment" (Vandenbroucke 2005).

There are three main challenges to the suitability of the AHS-MS files for this paper's analysis:

1) How reliable are homeowner estimates of the true market value of his or her housing unit? There have been numerous studies testing the accuracy of owner-reported house values compared to market-transactions. For the purposes of this paper, actual values matter less than changes in value, which, fortunately, seem to be more accurate. DiPasquale and Somerville (1995) compare the owner-reported value and transaction prices in the AHS and found that, while the actual values diverged, both follow a similar time series pattern. Further, Bucks and Pence (2006) find a close correlation between changes in owner-reported house value in the Survey of Consumer Finance and the external repeat-sales index developed by the Office of Housing Enterprise Oversight (OFHEO). This paper's estimates of nominal house value appreciation, based on the median compound average annual change of owner-reported house value in the AHS-MS, are roughly comparable to OFHEO's House Price Index (HPI) (see Appendix A). These estimates were generally lower than OFHEO's HPI, with only Sacramento and Denver higher. In general, changes in the reported value of house value appear to be a reliable measure of actual house price appreciation.

2) How reliable are two surveys, seven to nine years apart, of the overall household home improvement spending over that time span? Due to the length of time in between surveys, this paper assumes that characteristics of homeowners, such as home improvement spending, in these survey years provide a reasonable measure of those characteristics in the intervening years. The summary statistics in this paper are based on the median in a given geography of the two-survey average of a given characteristic (home improvement spending, house value, household income etc.) for each household in that geography. The reliability of this method was tested using the National AHS surveys from 1995-2005, which occur every two years. Looking at the four metropolitan statistical areas in the national file with over 200 matched observations, homeowners who were in the lowest quartile of average expenditures defined by the average of the 1995 and 2005 surveys typically had home improvement expenditures 58 percent below their respective metro median for the overall period (see Appendix B). While not perfect, this correlation seems reasonable enough to argue that categories created for the two surveys hold true for the intervening period.

3) How reliable are aggregations of respondents in the AHS-MS of the overall improvement spending for a given zone? With an adequate sample size, and the relative homogeneity of homeowners and houses within zones, this paper assumes that summary statistics based on observations in the AHS-MS are indicative of the overall characteristics of their respective zones. This is a difficult assumption to test and, admittedly, creates a substantial amount of noise in the data, limiting the sophistication of the analysis.

Metro Area Comparisons

The zones in the AHS metro files are dispersed across the nation and face different market conditions. The economies and housing supply-and-demand conditions in California are very different from Ohio or Louisiana. Consequently, the home improvement expenditures, value of the housing stock, and the appreciation of the housing stock, vary considerably by metro. Average annual home improvement expenditures by homeowners over this time period ranged from $1,112 in Charlotte, NC-SC to $2,082 in Seattle-Everett, WA (2004 $). House value varied even more, from $79,685 in San Antonio, TX to $237,772 in Sacramento, CA (see APPENDIX C). Average annual nominal appreciation rates ranged from 3.4 percent for Indianapolis, IN to 9.0 percent in Sacramento, CA.

Model

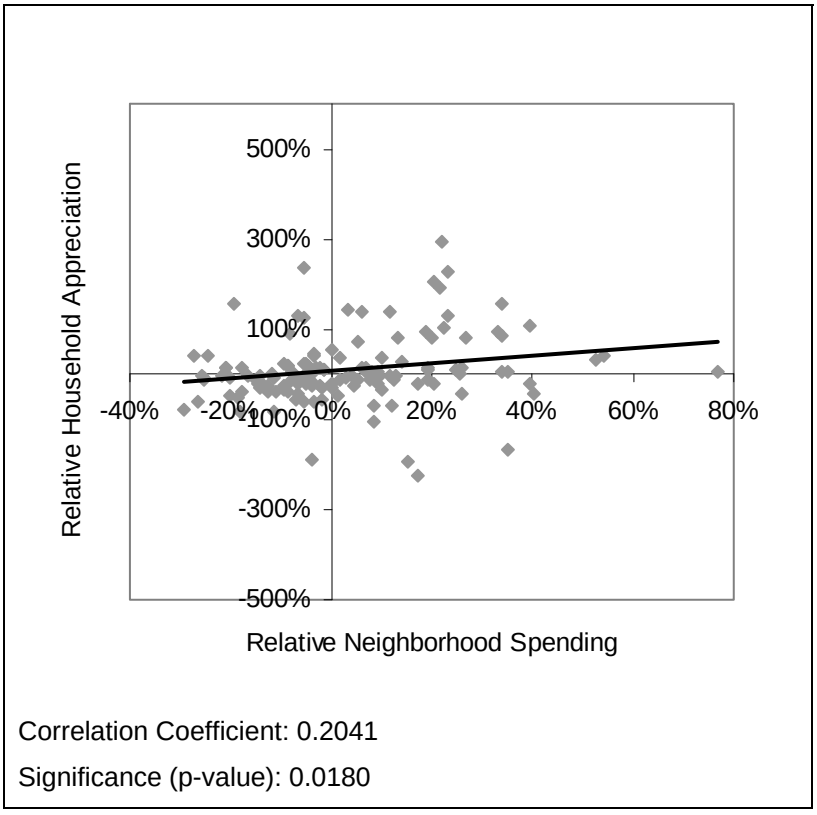
The hypothesis of this paper is that households in neighborhoods with relatively high home improvement spending will have relatively large increases in reported house value, even when compared to other households with a similar level of individual improvement spending. There are two primary variables in this model:

Neighborhood Spending - Neighborhood maintenance and home improvement expenditures are measured as the zonal median of homeowner improvement expenditures relative to their house value and metro-area median. This spending-to-value ratio is used because a given amount of home improvement activity would presumably have a larger marginal effect in a smaller, dilapidated property than a well-kept mansion, although results are similar using an absolute figure of expenditures. Expressing spending as a percentage difference from the metro-area median is done to control for metro-wide confounding factors.

Appreciation - Appreciation is measured as the zonal median compound average annual change in reported house value in a zone, again relative to metro-area median.

A minimum of one hundred observations in a zone is considered adequate for creating reliable neighborhood spending and appreciation statistics, resulting in 134 usable zones. Plotting these two variables yields a statistically significant correlation. However, examining a zone as a whole obscures the quantity and price components of value change. In other words, the increase in value due to individual home improvements cannot be separated from the increase due to the additional desirability of the neighborhood. (See Exhibit 2).

Exhibit 2: Relative Zone Home Improvement Spending and House Value Appreciation



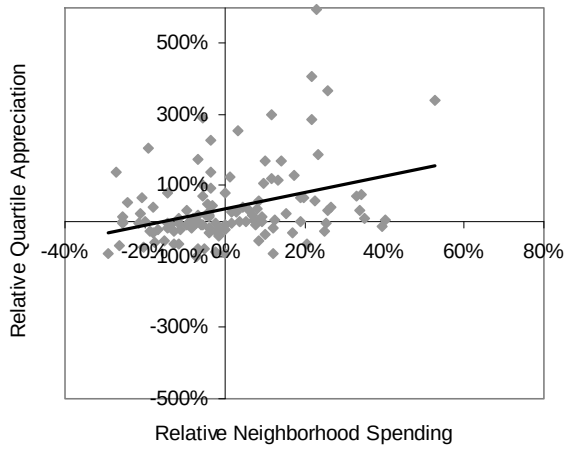
In order to control for the different changes in quantity of housing services, only households with similar relative expenditures should be compared. Consequently, a new variable is needed:

Household Spending - Household spending is measured by household expenditure-to-house value ratio quartiles, based on their respective metro-area.

The x-axis (neighborhood spending) remains the same, but appreciation is now measured by the subset of each zone which falls into these metro-defined spending quartiles. Further, appreciation of each quartile is expressed relative to the respective metro quartile, not the overall metro median. For more reliable results, only zones with at least 100 total observations and 25 observations for a given quartile are included in this analysis. The number of adequate zones used in each quartile ranges from 121 to 126. (See Exhibits 3 and 4).

Exhibit 3: Relative Zone Home Improvement Spending and Quartile House Value Appreciation

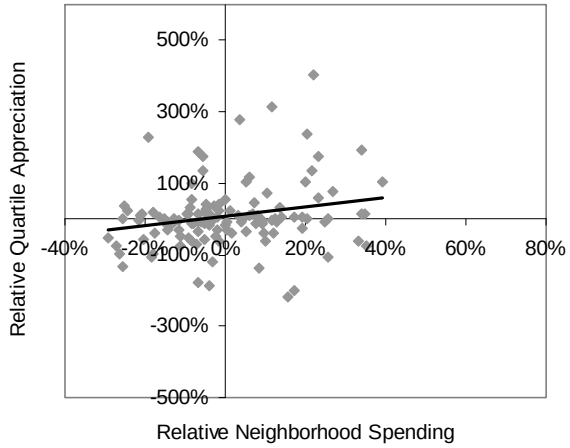
Lowest Quartile



Correlation Coefficient: 0.2386

Significance (p-value): 0.0084

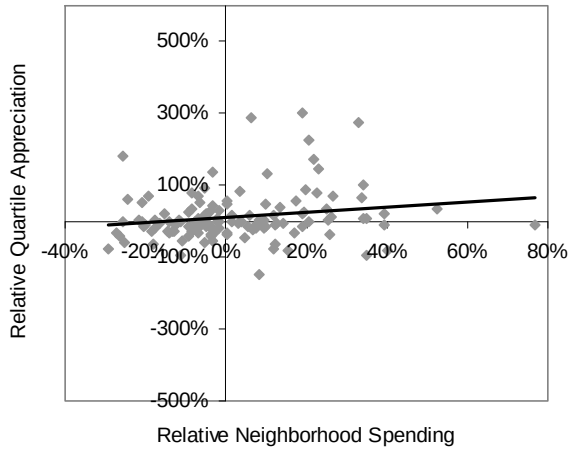
Low Quartile



Correlation Coefficient: 0.2195

Significance (p-value): 0.0151

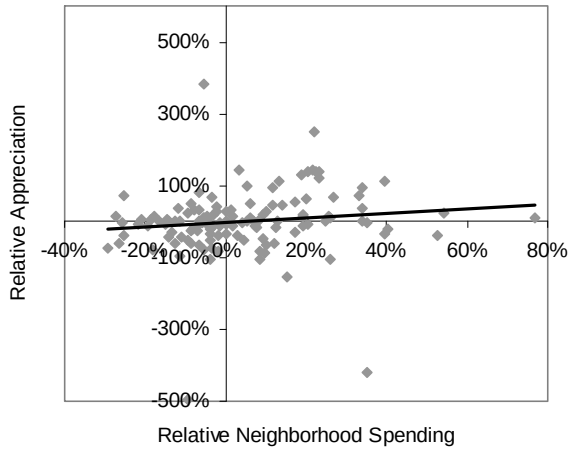
High Quartile



Correlation Coefficient: 0.1574

Significance (p-value): 0.0797

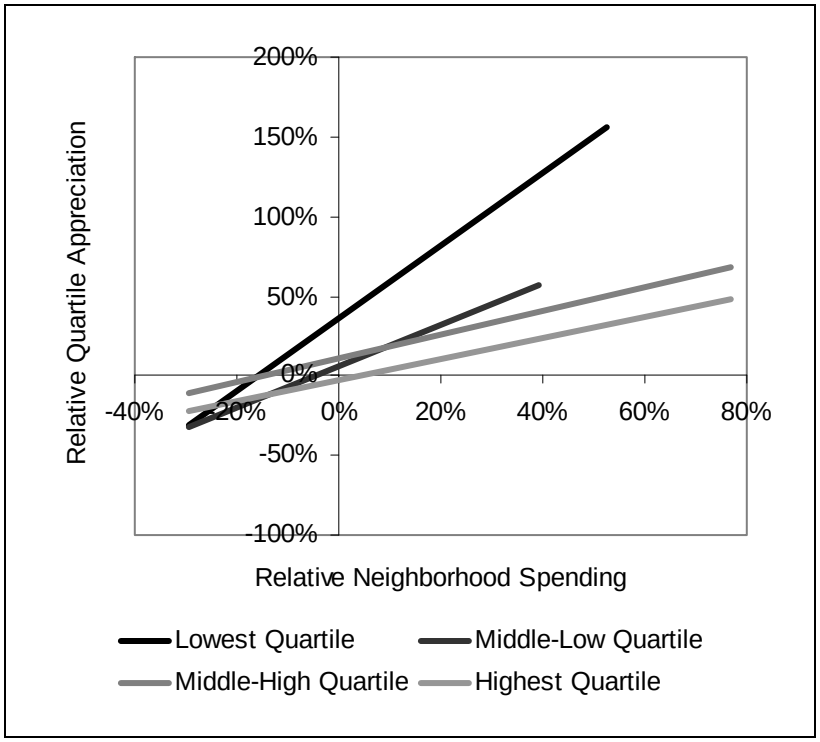
Highest Quartile



Correlation Coefficient: 0.1331

Significance (p-value): 0.1374

Exhibit 4: Relative Zone Home Improvement Spending and Quartile House Value Appreciation, Trendlines



Notice that both the magnitude and significance of the relationship declines as you move up the quartiles of individual spending. This follows Winger's theory that a homeowner may maximize the present value of his or her property by under maintaining it relative to the surrounding neighborhoods, thereby creating and maximizing the positive effect the neighborhood exerts on the homeowner's property. The weak relationship in the higher quartiles may also be related to the distribution of relative expenditures-to-value, which is skewed toward very little spending with a long tail at higher expenditure levels. Consequently, using household spending quartiles means the higher quartiles have wider ranges of expenditures. (See Appendix D).

Comparing median real appreciation rates in each household spending quartile by category of zone home improvement spending (either above or below the metro median) reveals, on average, higher appreciation rates in high spending neighborhoods—even for the same household-level quartile of spending—in 11 of the 18 metro-areas analyzed. The variation in the neighborhood effect could be influenced by intervening variables (discussed below), either at the neighborhood or metro-level. Looking across all metros, the average magnitude of this

difference (i.e. the spillover benefit of living in a neighborhood with relatively high home improvement spending compared to a low spending neighborhood) ranged from 0.22 to 0.41 percentage points in the inflation-adjusted rate of house price appreciation for the different household-level spending quartiles, and averaged 0.31 percentage points over the time period analyzed. In other words, high spending neighborhoods had an appreciation rate 11-19 percent higher than low spending neighborhoods, even for households with comparable levels of individual home improvement spending. Using the 18-metro average of a 15 percent higher real appreciation rate in high spending zones, a typical house worth $110,000 in 1996 would be worth nearly $160,500 by 2004 if located in a high spending neighborhood but less than $156,600 if located in a low spending neighborhood. The neighborhood effectively added $3,900 in house value over eight years. (See Exhibit 5; note that higher spending quartiles also have higher appreciation rates, indicating the increase in value due to a greater quantity of housing services).

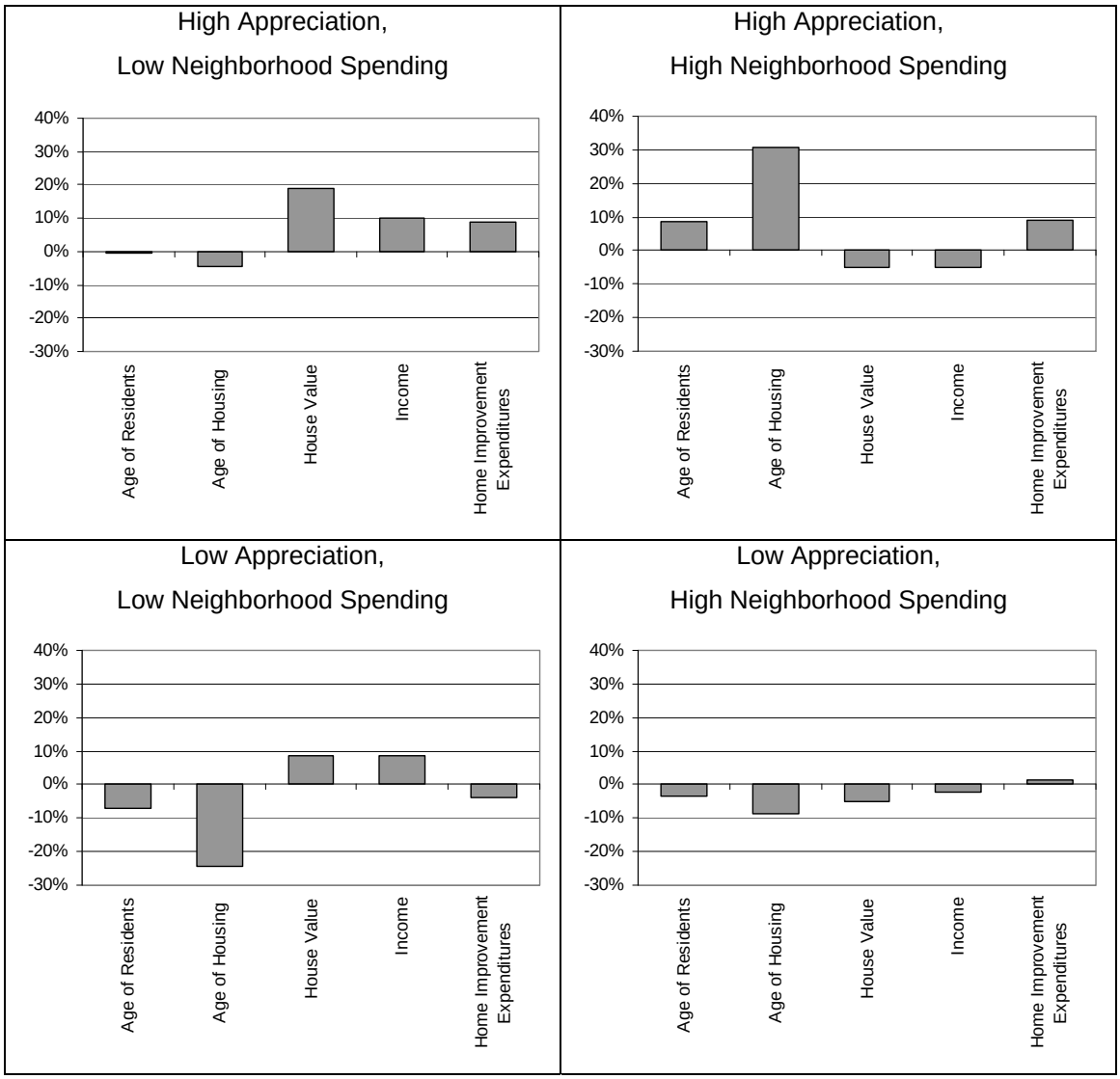
Exhibit 5: Average Annual Inflation-Adjusted House Value Appreciation Rate by Household-Level Spending Quartile, Across All 18 Metro Areas

	Household Spending Quartile				Overall
	Lowest	Low	High	Highest	
High Spending Neighborhood	2.18%	2.50%	2.45%	2.58%	2.43%
Low Spending Neighborhood	1.96%	2.09%	2.17%	2.24%	2.12%
Difference					
percentage point	0.22	0.41	0.28	0.34	**0.31**
percent	11%	19%	13%	15%	**15%**

Intervening Factors

In addition to the difficulty of determining causation, other variables may intervene, confound, or otherwise affect the relationship between home improvement and appreciation. This paper does not intend to develop a fully specified hedonic model of house price appreciation, but would like to address a few of these variables. The charts below show these variables as profiles of the neighborhoods in the quadrants created by the scatter plots exhibited earlier. (See Exhibit 6).

Exhibit 6: Quadrant Comparison of Neighborhood Types



Age of Housing Stock - The variable which varies the most is the relative age of the housing stock, as measured by the share of houses built before 1970 compared to the metro-wide share. Older homes require more routine maintenance and repair, so it is not surprising, that neighborhoods with higher shares of old homes had have more home improvement spending, compared to their respective metros. On average, these neighborhoods had an expenditure-to-value ratio 9 percent above their respective metro median, while neighborhoods with younger housing stock had spending levels 2 percent below the metro-area. This variable has an even more robust correlation with neighborhood appreciation. Older neighborhoods typically had a house value appreciation rate 43 percent above their respective metro, while appreciation in

younger neighborhoods was 15 percent less than the metro. Combined, this means that older homes are concentrated in the high spending, high appreciation quadrant of neighborhoods. Indeed, this group averaged a share of old homes 31 percent higher than their metros, while low spending, low appreciating neighborhoods had a share of old homes 23 percent less than their respective metros. Grouping the metro-areas into three groups of six ordered by age of the housing stock, shows that the middle category, or metros with 22-24 percent of the houses built before 1970, showed the least difference between high and low spending neighborhoods. Meanwhile, the six metros with the highest share of old houses had the largest difference.

House Value - The value of the housing stock is correlated with relative expenditure-to-value ratios, but not relative appreciation rates. Higher valued homes are associated with expenditure ratios 3 percent below the metro median, while lower values are associated with ratios 7 percent above the median. Similarly, neighborhoods with high expenditure-to-value ratios are characterized by lower values. However, the difference may simply be a result of scaling home improvement spending by house value and the relatively inelasticity of home improvement spending. There are some maintenance and improvements which must be made regularly, so house values vary more than home improvement spending. Consequently, houses on the lower end of the value scale will tend to have higher expenditures-to-value ratios.[1] Looking at categories of metro-areas, the highest value metro areas, with typical house values over $140,000 (2004 $), had the largest difference in appreciation rates between high and low spending neighborhoods. The metros with the lowest house values, typically under $110,000 (2004 $), had the smallest difference.

Age of Residents - The relative share of homeowners over 65 years of age appears to be correlated with both variables of interest, but especially relative house value appreciation. Neighborhoods with older residents had appreciation rates 25 percent above the metro median, while younger neighborhoods had appreciation rates 6 percent below. Consequently, neighborhoods in the upper quadrants of appreciation have higher rates of senior residents. The

[1] Looking at expenditures alone, high value neighborhoods had spending levels 17 percent above the metro median, and lower value neighborhoods 11 percent below their respective metros. This relationship between expenditures and initial value mirrors Leventis (2007) who found average prices for renovated homes before renovation were 5-10 percent higher than for un-renovated properties.

six metros with the smallest share of senior citizens (roughly under 22 percent) had a higher average difference in appreciation rates between high and low spending neighborhoods, nearly four times the average difference in the other twelve metro-areas.

Income of Residents - The relative income of a neighborhood is strongly correlated to both the relative value of the housing stock and relative level of expenditures. This creates the same dynamic as house values, where the relatively inelasticity of expenditures results in high income neighborhoods having lower expenditure to value ratios. Specifically, these neighborhoods have spending ratios 3 percent below the metro median, while low income neighborhoods have ratios 8 percent above the median and neighborhoods with high spending ratios typically have lower incomes.[2] The difference in appreciation rates between high and low spending neighborhoods was stronger in middle and high income metro-areas. In low spending metros, with typical household incomes less than $55,000 (2004 $), low spending neighborhoods actually had a higher appreciation rate, on average, although the difference was not statistically significant.

Intra-Metro Location - There appears to be a significant difference between the urban and suburban neighborhoods of the selected metros.[3] Zones designated as urban had appreciation rates 58 percent above the metro median, and spending ratios 10 percent above, while suburbs had appreciation rates 6 percent below metro median and spending ratios roughly at the median. Urban zones are also associated with higher expenditure ratios. This phenomenon may be related to the fact that the urban neighborhoods tend to have older and lower valued housing stock.

The correlations between these intervening variables and the variables of interest are statistically significant for most (see Appendix E). However, a simple linear regression including these does not eliminate the statistical significance of the neighborhood expenditure-to-value ratio on appreciation rates (see Appendix F). (Note: household expenditures are controlled for through the appreciation rate, which is based on the household quartiles discussed earlier). Again, this paper does not attempt to develop a fully specified hedonic model of house value appreciation.

[2] Again, looking at expenditures alone, the relationship is reversed, with high income neighborhoods spending more (13 percent above median compared to 9 percent below).
[3] The American Housing Survey defines a zone as urban if it falls within the central city of an MSA and suburban if it does not.

Instead, the purpose is merely to determine whether or not a neighborhood effect appears to exist. These variables are mentioned in order to show that other dynamics are at play. The interaction of these merits further research; unfortunately, the data limitations of the AHS-MS prevent further sophistication and elaboration in this analysis. Still, these correlations seem to reasonably suggest a statistically significant effect of neighborhood improvement activity.

Conclusion and Discussion

This paper finds a modest but statistically significant effect of neighborhood home improvement activity on house value appreciation, even for individual households with comparable levels of improvement spending. Following theory, this "neighborhood effect" was strongest among those households which spend the least individually. Further, the higher spending neighborhoods had, on average, higher appreciation rates, even when looking at comparable levels of household home improvement spending, in 11 of the 18 metro-areas analyzed. Looking across all metros, the average magnitude of this difference amounted to an inflation-adjusted annual appreciation rate roughly 15 percent higher over the time period analyzed. For a typical house worth $110,000 in 1996, this would yield an additional $3,900 in value by 2004.

Policy Implications

The neighborhood effect is fundamentally an externality. If homeowners fail to account for the spillover benefits of their home improvement activity, then a less than socially optimal level of maintenance and improvement will occur. Consequently, there may be a case for government intervention. Indeed, various zoning and building code regulations are based on recognition of these neighborhood effects. These types of regulations mandate certain activities, while other government interventions create incentives for homeowners to incorporate social costs and benefits into their decision-making, for example in the form of a subsidy. Admittedly, the substantive significance of the neighborhood effect is small; meaning the administrative costs for such intervention would likely outweigh the benefits. However, the neighborhood effect could be used as one of many factors used to justify a public policy, such as historic preservation tax credits. Historic preservation is often argued for on the basis of cultural heritage, or the jobs

and tax revenue created; the effect on house values surrounding the historic property provides just one additional rationalization for such policies.

The neighborhood effect is also pro-cyclical, in that is reinforces the prevailing trend of the neighborhood. When the neighborhood level of home improvement activity is high or rising, individual homeowners see their house values rise and are more likely to invest in their properties. On the other hand, in a deteriorating neighborhood a rational homeowner reduces maintenance and improvement spending. Understanding the pro-cyclical nature of the neighborhood effect is also of interest to policy-makers and social activists. The rising house values related to a high neighborhood improvement activity can sometimes result in the displacement of residents, in a process called gentrification. Alternatively, a foreclosure crisis, which leaves homes abandoned and under-maintained, has been proven by other studies to result in falling property values throughout the neighborhood. The neighborhood effect in this case would further push that neighborhood into decline. Consequently, the reinforcing nature of the neighborhood effect calls for quick action to prevent decay or displacement from escalating.

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Appendix A

Nominal Average Annual House Value Appreciation Comparison, 1995/1996 – 2002/2004			
	OFHEO	AHS (owner estimates)	difference
Atlanta, GA	5.6%	4.8%	-0.8%
Charlotte, NC-SC	4.7%	3.8%	-0.9%
Cleveland, OH	3.7%	3.4%	-0.3%
Columbus, OH	4.5%	3.7%	-0.8%
Denver, CO	7.2%	7.3%	0.1%
Hartford, CT	5.5%	5.2%	-0.3%
Indianapolis, IN	3.4%	3.1%	-0.3%
Kansas City, MO-KS	5.8%	4.9%	-0.9%
Memphis, TN-AR-MS	3.6%	2.9%	-0.8%
Miami-Ft. Lauderdale, FL	5.9%	4.2%	-1.7%
New Orleans, LA	5.3%	5.0%	-0.3%
Oklahoma City, OK	4.2%	4.0%	-0.2%
Pittsburgh, PA	4.1%	3.0%	-1.1%
Portland, OR-WA	5.4%	4.4%	-1.0%
Sacramento, CA	9.0%	10.0%	1.0%
St. Louis, MO-IL	5.4%	4.9%	-0.6%
San Antonio, TX	3.4%	3.0%	-0.4%
Seattle-Everett, WA	6.6%	6.3%	-0.3%
mean	*5.2%*	*4.7%*	*-0.5%*
standard deviation	*1.5%*	*1.8%*	*0.6%*

Appendix B

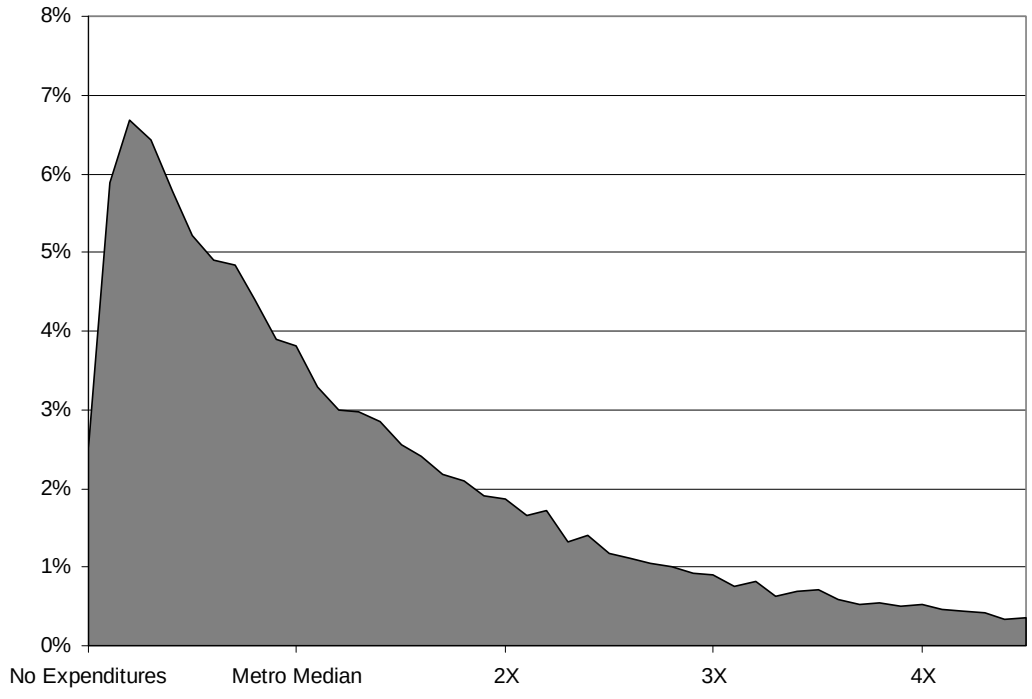
Percent Difference of Quartile Median of Average Home Improvement Expenditures from Metro-Area Median of Average Expenditures, From 1995 Through 2005				
	Quartile of Average Expenditures From 1995 & 2005 Only			
	Lowest	Middle-Low	Middle-High	Highest
Chicago, IL	-50%	-36%	0%	104%
Detroit, MI	-41%	-20%	-7%	86%
Los Angeles-Long Beach, CA	-86%	-40%	6%	160%
Philadelphia, PA-NJ	-55%	-17%	2%	153%
Quartiles of home improvement expenditures are defined using the average expenditures from the 1995 and 2005 National AHS. Then the average home expenditure level is found for each household across the six surveys from 1995 *through* 2005. The median of this overall expenditure level for the quartiles created using only the end-year surveys shows that those categories remain largely accurate for the entire period.				

Appendix C

Home Improvement Expenditure and House Value Comparison (Two-Survey Average, 2004 $)		
	Home Improvement Expenditures	Reported House Value
Atlanta, GA	1,350	148,237
Charlotte, NC-SC	1,112	117,540
Cleveland, OH	1,689	126,455
Columbus, OH	1,409	123,737
Denver, CO	1,812	189,081
Hartford, CT	1,801	181,267
Indianapolis, IN	1,675	117,188
Kansas City, MO-KS	1,540	107,549
Memphis, TN-AR-MS	1,264	100,520
Miami-Ft. Lauderdale, FL	1,260	128,897
New Orleans, LA	1,401	107,918
Oklahoma City, OK	1,245	87,513
Pittsburgh, PA	1,281	99,580
Portland, OR-WA	1,459	168,271
Sacramento, CA	2,081	237,772
St. Louis, MO-IL	1,495	113,178
San Antonio, TX	1,292	79,685
Seattle-Everett, WA	2,082	233,285
mean	*1,514*	*137,093*
standard deviation	*286*	*46,698*

Appendix D

Distribution of Expenditures-to-Value (Two-Survey Average, All Metro-Areas)



Appendix E

Correlation of Intervening Variables with House Value Appreciation and Home Improvement Expenditures Relative to Value *(p-value)*		
	House Value Appreciation	Home Improvement Expenditures/Value
Age of Housing Stock	0.4247 *0.0000*	0.3766 *0.0000*
House Value	-0.0711 *0.1144*	-0.3939 *0.0000*
Elderly Share of Residents	0.2852 *0.0000*	0.204 *0.0000*
Income	-0.1959 *0.0000*	-0.303 *0.0000*
Located in Central City	0.2398 *0.0000*	0.1797 *0.0001*

Appendix F

Linear Regression Analysis of the Effect of Neighborhood Expenditures Relative to Value on a Given Subset of Households Defined by Metro-Area Quartiles of Individual Expenditures, With Intervening Variables Included

Number of obs	494
F(6, 487)	12.66
Prob > F	0.0000
R-squared	0.2242
Adj R-squared	0.2065
Root MSE	0.8899

Source	SS	df	MS
Model	110.296433	11	10.0269485
Residual	381.707323	482	0.791923906
Total	492.003756	493	0.997979221

Subset Appreciation	Coef.	Std. Err.	t	P>t
Neighborhood Expenditures/Value	0.531431	0.271947	**1.95**	**0.051**
Resident Age	-0.46976	0.289554	-1.62	0.105
Housing Age	1.018836	0.176634	5.77	0.000
Housing Value	1.911276	0.407022	4.7	0.000
Income	-2.11738	0.525672	-4.03	0.000
City Dummy	0.084231	0.120212	0.7	0.484
Quartile Dummy 2	-0.09756	0.114351	-0.85	0.394
Quartile Dummy 3	-0.09594	0.113673	-0.84	0.399
Quartile Dummy 4	-0.1936	0.113549	-1.7	0.089
Survey Year Dummy 1	-0.00702	0.096511	-0.07	0.942
Survey Year Dummy 2	-0.05385	0.102027	-0.53	0.598
Constant	0.281516	0.517478	0.54	0.587

The purpose of this linear regression is simply to show the statistical significance of the external effect remains even after controlling for some intervening variables.